THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXV. No. 885.] LONDON, APRIL 27, 1880. [32nd Year. Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
26, 27, & 28, FENCHURCH ST.,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
Several Prize Medals. Established over 20 Years.
These Paints are now used by all the London Gas Companies and most of the principal Country Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
Proprietors: STEVENS & CO.,
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Works: BRIXHAM, TORBAY.

TUBES.
Tubes and Fittings for Gas, Steam, Water, and Hydraulic purposes, plain, galvanized, white enamelled inside, or coated by Dr. Angus Smith's process, or oxidized by Professor Barff's patent process. Gas-fitters tools, brass cocks, &c.

JOHN SPENCER,
VULCAN TUBE WORKS,
WEST BROMWICH, STAFFORDSHIRE,
AND
97, CANNON STREET, LONDON.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
Head London Office:
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ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNTS
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
Established 1830.

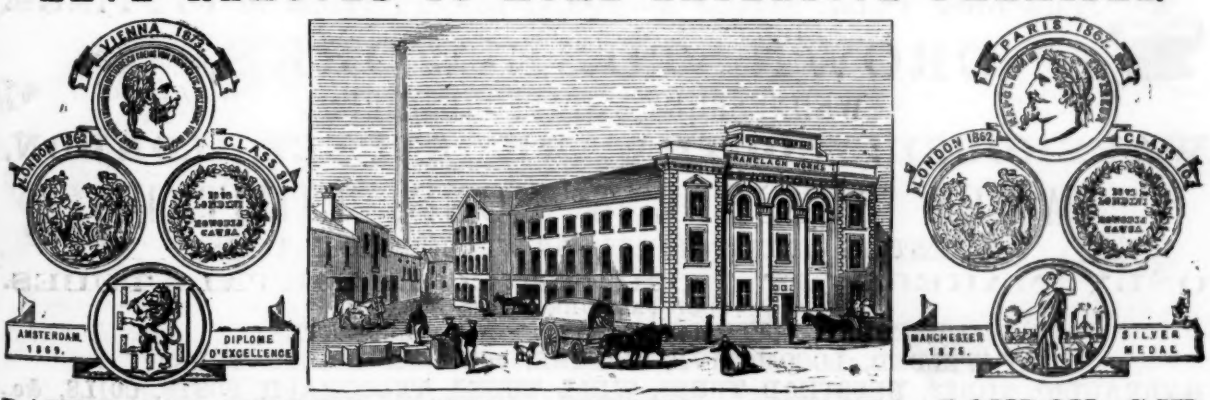
THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE,
From ½ to 40 H.P. ind.
See Page 622.

CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

CHANGE OF ADDRESS.
GEORGE GLOVER AND CO.,
DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES.



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

WELLINGTON TUBE WORKS,

GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.

NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

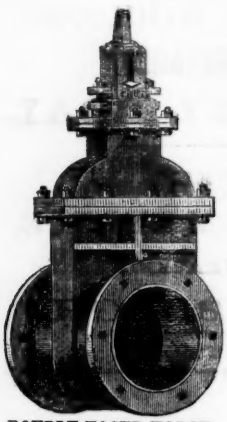
GAS APPARATUS;

CONTRACTORS FOR THE

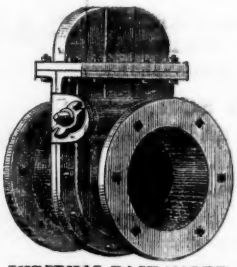
ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

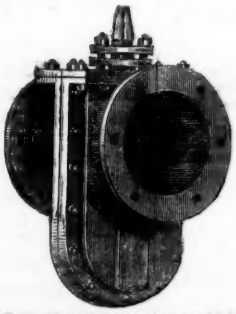
C. & W. WALKERS' GAS-VALVES.



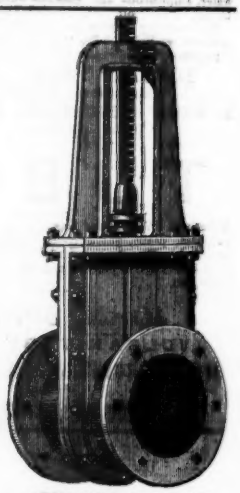
DOUBLE-FACED VALVE SPECIALLY FOR PURIFIERS.



INTERNAL RACK-VALVE WITH STEEL PINION, FOR GENERAL USE.



UNDERGROUND SCREW-VALVE FOR SHALLOW STREET-MAINS.



ORDINARY RACK AND PINION VALVE.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

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WAREHOUSE: SOUTHWARK STREET, LONDON.

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PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

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TUBES and FITTINGS for GAS, STEAM, and WATER;

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HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

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CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

LONDON OFFICES: 97, CANNON STREET—JAMES E. & SAMUEL SPENCER, AGENTS.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

SAMUEL CUTLER & SONS,

CONTRACTORS FOR GAS & WATER WORKS, GENERAL ENGINEERS, IRONFOUNDERS & MANUFACTURERS OF

GASHOLDERS, TANKS, PURIFIERS,

SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORKS.

S. C. & Sons undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.

They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

Manufacturers of MORRIS & CUTLER'S PATENT CONDENSER & CUTLER'S PATENT GAS-WASHER.

DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to Mr. F. MORRIS, GAS-WORKS, BRENTFORD, or to S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT LIGHTHOUSE GAS-BURNERS,

For Street Lighting and the Illumination of Large Halls, Factories, Ship Yards, &c., where Powerful Light is required.

These Burners have been adopted by a School Board, having large school-rooms in charge, because of their high illuminating power and the facilities they give for perfect ventilation. The actinic power of these Burners is such that they are used successfully for Photography and Photo-Lithography.

SOLE MANUFACTURERS:

J. EDMUNDSON & CO., Gas Engineers, 19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

GEORGE BOWER,

GAS AND WATER ENGINEER AND CONTRACTOR,

ST. NEOTS, HUNTS.

Gas Apparatus supplied for **Works** of any magnitude, from those suitable for experimental purposes to those capable of producing one million cubic feet per day.

VERTICAL RETORT APPARATUS for small Private Works, and for Testing Coal.

DOUBLE-ACTING RETORT APPARATUS for Producing Gas from Oil, Resin, Peat, Wood, and Coals.

RETORT-FITTINGS, CONDENSERS, SCRUBBERS, ENGINES AND EXHAUSTERS, PURIFIERS, STATION-METERS, GASHOLDERS, GOVERNORS, METERS, CENTRAL CHANGE VALVES, FOUR-WAY BYE-PASS VALVES, & VALVES OF ALL DESCRIPTIONS.

GASHOLDER TANKS, IN CAST OR WROUGHT IRON.

HIGH-PRESSURE AND CONSUMERS GAS-REGULATORS. WET AND DRY GAS-METERS.

APPARATUS FOR LIGHTING RAILWAY CARRIAGES WITH GAS.

AIR-LIGHT APPARATUS.

LAMP COLUMNS, SHADOWLESS HEXAGONAL LANTERNS on the Interchangeable Principle.

Plans, Specifications, and Estimates for Gas-Works of any magnitude.

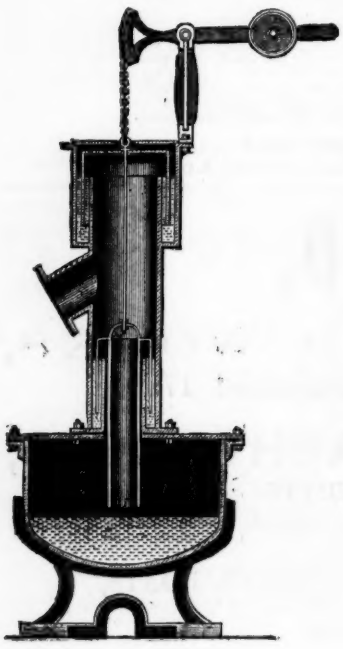
References in every Quarter of the World to Works erected during the past Quarter of a Century.

Second Edition of "The Gas and Water Engineer's Book of Reference," 4s. Companion, with Detailed Costs, 1s., post free.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



The following Testimonials, as to five years constant working of this Patent Removable Dip, have been received:—

Metropolitan District Asylum Gas-Works, Caterham, Surrey, Jan. 15, 1874.

Messrs. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.

Metropolitan District Asylum Gas-Works, Caterham, Surrey, Dec. 30, 1879.

Messrs. CHANDLER and SONS.

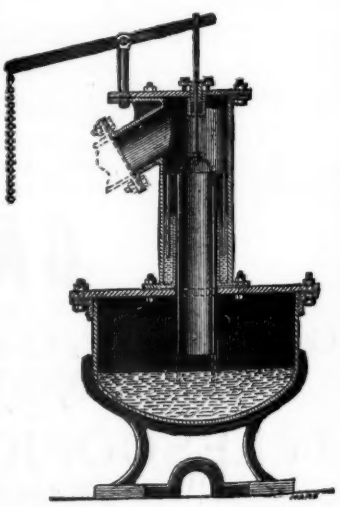
DEAR SIRS,

In reply to your inquiry, it is with very much pleasure thatI endorse every word of my letter of Jan. 15, 1874; and I may add that from the date the Patent Dips were fitted, they have worked perfectly, and there is very little carbon deposited in the retorts, in consequence of the lower pressure.

Yours faithfully,

(Signed) W. CRICKMAY,

Memb. Soc. Engineers.



APPLICATIONS TO BE MADE TO

Messrs. CHANDLER & SONS,

104, NEWINGTON CAUSEWAY, S.E.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER,

FOR

GAS PURIFICATION,

TAKES OUT EVERY TRACE OF AMMONIA AND A LARGE QUANTITY OF CARBONIC ACID AND SULPHURETTED HYDROGEN BY ONCE PASSING THROUGH THE MACHINE.

AMMONIACAL LIQUOR OBTAINED OF ANY REQUIRED STRENGTH.

The Cost of the Machine defrayed by the Ammonia obtained in Twelve Months.

It requires very little attention, and cannot get out of order.

THESE MACHINES HAVE BEEN SUPPLIED TO THE FOLLOWING GAS-WORKS:—

	Feet per Day.
The Gaslight Company, London—	
Beckton	5,000,000
Bromley	7,000,000
St. Pancras	3,000,000
Bradford Corporation	1,000,000
Bremen	150,000
Buxton Local Board	250,000
Dukinfield Local Board	500,000
Driffield Company	100,000
Goole Company	250,000
Glossop Company	300,000
Holywood Company	125,000
Heywood Local Board	600,000
Leeds Corporation	2,000,000
Leominster Company	150,000
Maidstone Company	1,000,000
Phœnix Company, Greenwich	2,500,000
" " Vauxhall	3,000,000
Woolwich Equitable Company	400,000
Yeadon Company	500,000

AND MANY ARE IN COURSE OF CONSTRUCTION;

Among others, four, for 3 million feet per day each, for the Corporation of Leeds; three, for $1\frac{3}{4}$ million feet each, for the Corporation of Salford; three, for 5 million feet, for The Gaslight and Coke Company, London; one, for 3 million feet, for the London Gas Company, Nine Elms, &c. &c.

TESTIMONIALS.

Messrs. KIRKHAM, HULETT, and CHANDLER. *Engine-Works, Millbank, Westminster, S.W., March* 5, 1879.

Gentlemen,—In accordance with your instructions, I have taken diagrams from Vertical Engine driving your Patent Horizontal Washer-Scrubber to purify 60,000 feet of gas per hour on the works of The Gaslight Company at King's Cross, and find the following results, viz.:—

Horse power required to drive engine, shafting, and gearing alone	= 0·398
Total horse power with washer on	= 1·721
Absolute horse power required to drive Washer-Scrubber	= 1·323

(Signed) THOS. HORN.

Messrs. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Aug.* 12, 1879.

Gentlemen,—In reply to your inquiry, one of your Patent Scrubber-Washers to purify 100,000 cubic feet per hour was put into operation at these works on the 1st of June. At the same moment the whole of our Scrubbers, equal to 28,000 cubic feet, were thrown out of use, leaving your Washer the whole work of freeing the gas from Ammonia. This it has done to perfection up to date. With 10 gallons of water to each ton of coal carbonized passing through it we get a clean test at the seventh chamber, leaving four chambers margin for extra work. The mean quantity of Ammonia in the inlet (fixed and free) obtained from a large number of tests was 241 grains per 100 feet of gas. On the outlet—Free Ammonia—Nil. The quantity of water used is 10 gallons per ton of coal carbonized. The strength of liquor as follows:—

Chamber No.	1	2	3	4	5	6	7	8	9	10	11
Strength of liquor—ounces	Nil.	Nil.	Nil.	Nil.	0·4	1·0	2·2	3·5	5·5	8·25	12·5

We are working five revolutions per minute. It takes out all the free Ammonia, reduces the carbonic acid and sulphuretted hydrogen 30 per cent., requires a very small amount of power to drive, and altogether is, in my opinion, the best machine for the purpose yet invented, and will, I feel confident, ere long, entirely supersede the Scrubbers of to-day. I am glad to find you are going to fix one of these Washers at our Vauxhall works. (Signed) P. J. WATES, Engineer.

For Results and other Testimonials, see next week's Journal.

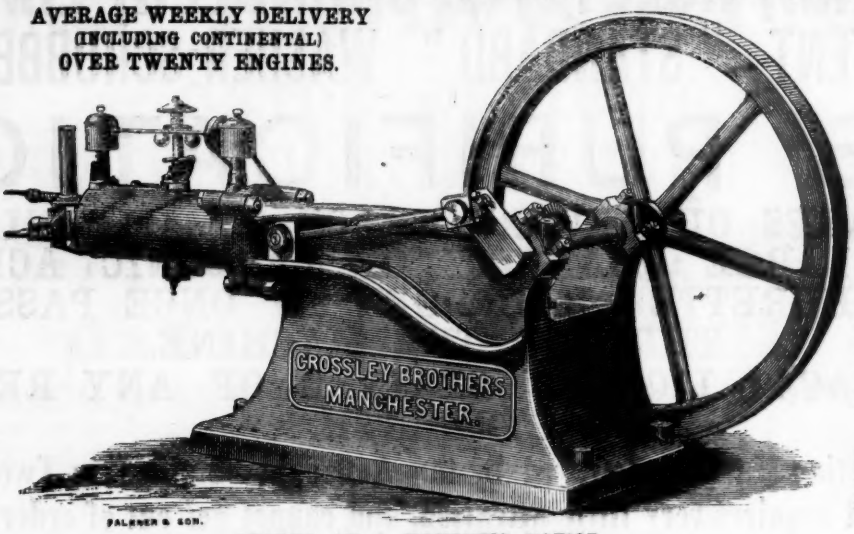
FOR FURTHER PARTICULARS AND TESTIMONIALS, ADDRESS MESSRS.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

AVERAGE WEEKLY DELIVERY
(INCLUDING CONTINENTAL)
OVER TWENTY ENGINES.

The durability of these Engines is now established by experience, one of them having run night and day at the Hinckley Gas-Works for over Twelve months without any expenditure for repair; this being equal to about 2½ years average work.



Over 2500 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE.

(Otto and Crossley's Patents, 1876 and 1877,)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. SIZES { NOMINAL HORSE POWER ½ 1 2 3½ 6 8 12 16 / MAXIMUM HORSE POWER ¼ 1½ 2½ 4 9 12 18 24 } OFFERED. CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

WORKS AND HEAD OFFICES: Gt. Marlbro' St., Gloster St.

CROSSLEY BROTHERS, MANCHESTER.

LONDON HOUSE: 116, Queen Victoria St., E.C

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS, ROTHERHAM;

AND 85, SOUTHWARK ST., LONDON, S.E.

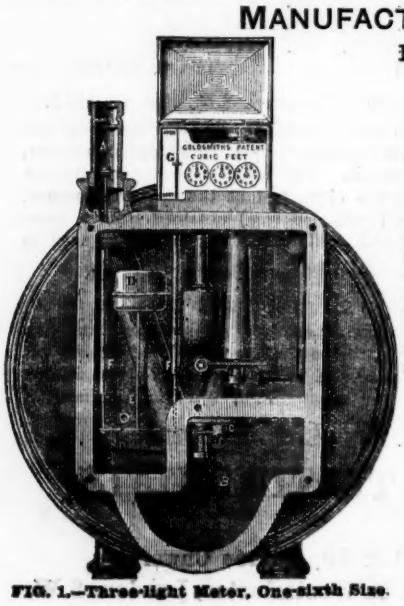


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

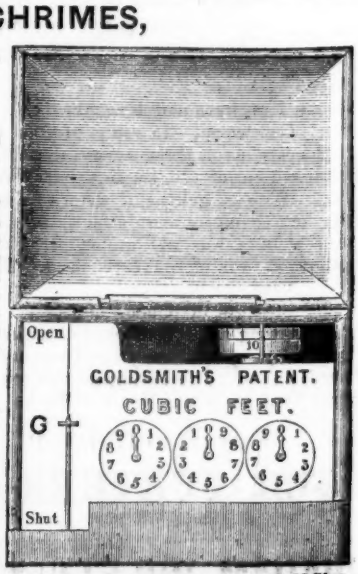
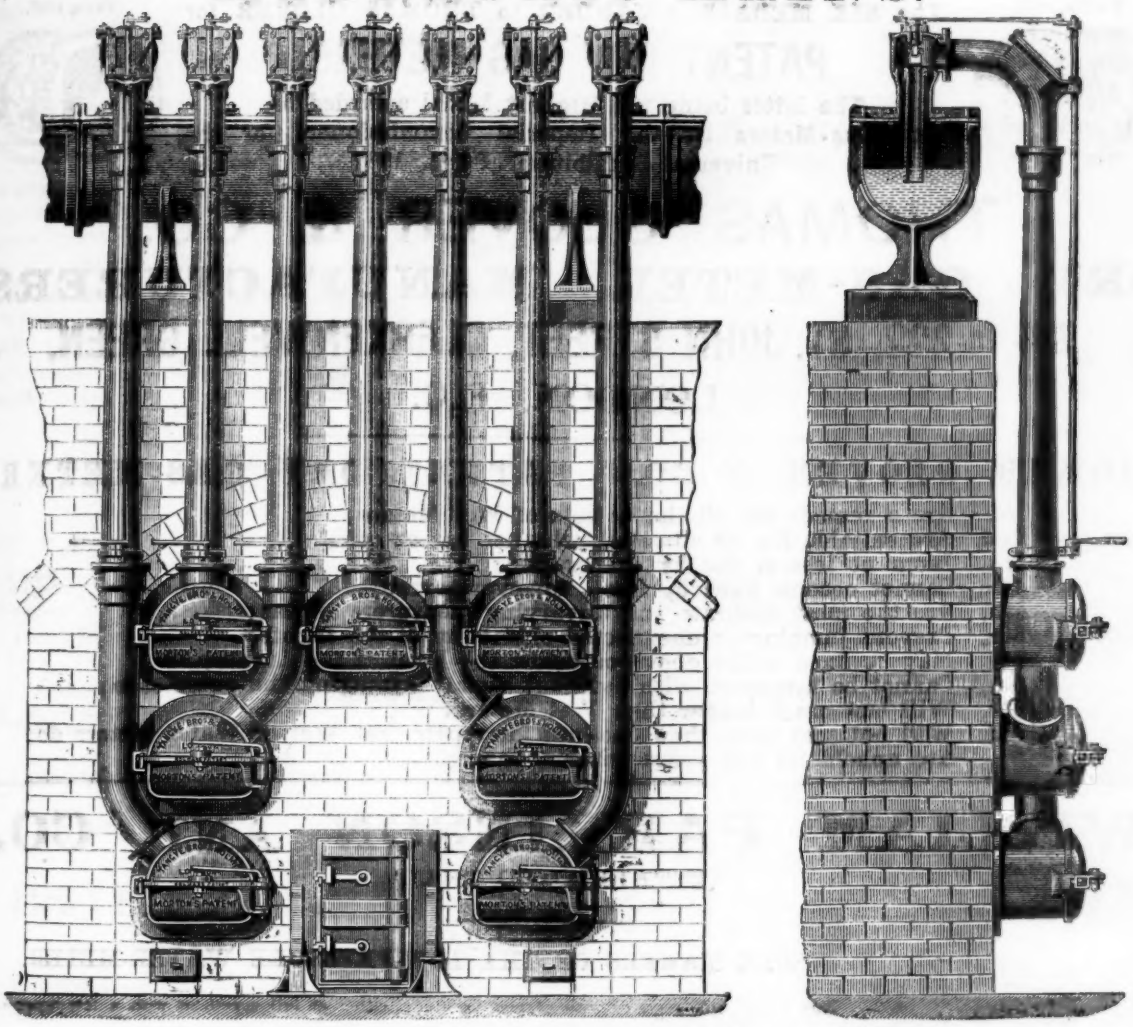


FIG. 2.—Three-light Index, Half Size.

HOLMAN'S PATENT
NON-PRESSURE VALVULAR SEAL-PIPES
FOR
HYDRAULIC MAINS.



The salient features of the above arrangement are as follows:—

1. The Seal is instantaneously opened and closed from the stage by the stokers.
2. There are only two positions for the actuating lever: one when the Seal is opened during the period of carbonization, the other when it is closed for drawing and charging the retort.
3. The retort can never be blocked, beause the port directing the gas *through* the Seal is always opened, and the port permitting the gas to *pass* the Seal *direct* into the hydraulic main is also open while the retort is at work.
4. The manager and stokers can always see at a glance, by the position of the lever, whether the retort is duly unsealed while carbonizing its charge.
5. There are no extraneous seals, stuffing-boxes, hinges, screws, chains, pulleys, springs, teeth, or other complication belonging to the valves; they are made plain and strong for rough use, and will last many years without renewal.
6. The valve faces are always covered and never separated, hence no foreign matter can put them out of action.
7. They are positive, reliable, interchangeable, free from all the uncertainty of automatic arrangements, and low in price.
8. No extra pipes or connections are required, because the Valvular Seal-pipe is self-contained in the single branch of the ascension-pipe, which stands on the hydraulic main, and is easily accessible by removing an ordinary cover secured by two bolts only.

(238) TWO HUNDRED AND THIRTY-EIGHT HOLMAN'S PATENT VALVULAR SEAL-PIPES are being fitted to the Hydraulic Mains at the Radford Station of the Corporation Gas-Works at Nottingham.

(84) EIGHTY-FOUR more are being fitted to the Mains in the New Retort-House of the Gas-Works at Brentford, and they can be readily applied to existing Hydraulic Mains generally.

They are to be fitted to the Hydraulic Mains of the New Retort-House at the LONDON GAS-WORKS, and at other large stations.

Mr. MORTON writes in the following terms, under date of Feb. 3, 1880:—

"Gentlemen,—I have determined to use your HOLMAN'S PATENT NON-PRESSURE VALVULAR SEAL-PIPES in our new Retort-House. Will you, in the meantime, send me, as soon as you can, four as you are now making them. I expect to hear of a large demand for these Pipes. I like the idea of always maintaining a passage through an ordinary dip."

ESTIMATES for Retort Work, including Mouthpieces fitted with Morton's Patent Self-Sealing Lids and Holman's Self-Sustaining Cross-Bars and Fastenings, Hydraulic Mains and Ascension-Pipes, fitted with Holman's Patent Non-Pressure Valvular Seal-Pipes complete (as per accompanying illustration), will be forwarded to Engineers on receipt of particulars of intended erections, or re-setting of Retorts during the current or ensuing season.

Engineers preparing Specifications will be furnished with Tracings and all necessary data on application.

Sole Makers:

TANGYE BROTHERS AND HOLMAN,
HYDRAULIC AND GAS ENGINEERS,
CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters bv the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

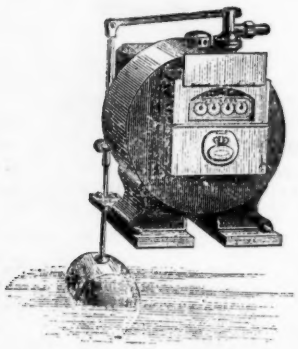
LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.

(ESTABLISHED 1816.)



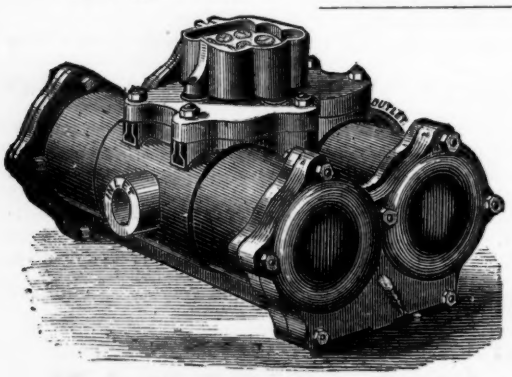
SOLE MAKERS OF THE LOW-PRESSURE WATER-METER.

This Meter will register with perfect accuracy, either at full speed, or with a few drops only passing through it.

It must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below.

Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



HIGH-PRESSURE WATER-METER.

The Union Water-Meter, of which an external view is here given, is of the positive class—*i.e.*, a Meter in which a measuring chamber is alternately filled and emptied, each filling being duly recorded. It is formed of two cylinders, with double pistons in each, having a rotary-valve of peculiar construction, which is worked from cams on the piston-rods.

It is claimed for this Meter, among its advantages over other Piston Meters in use, that it is extremely small and compact, and that its durability and accuracy have been proved by the fact that upwards of 20,000 of them, of various sizes, are in successful operation in the States. In England the instrument has been fully tested by several Water Engineers of eminence, and pronounced by them as a reliable and satisfactory register of water supply; it is also economical in cost.

ALL METERS are TESTED with 60 lbs. pressure before they are sent out.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

J. M.—*Such a proceeding would be decidedly illegal.*

A SUBSCRIBER (Lancashire).—*"No notice can be taken of anonymous communications." To this rule we do not make any exception. If you will send your name and address (not for publication), an answer shall be given to your queries.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 27, 1880.

Circular to Gas Companies.

THE Metropolitan gas world still remains in a state of quiescence. It is natural that it should do so, considering the prosperous condition of all the Companies. The sliding scale has worked so well that those undertakings which share its advantages are now paying a considerably enhanced dividend over that previously enjoyed. The London Company alone pay a mere ten per cent., when, by amalgamation, the Shareholders might receive at the present time at least another one and a quarter per cent. We confess that we do not understand the policy of this Company. Nothing has been more clearly proved than that combination improves the circumstances of every Company joining with others in the supply of gas. If the London Company had availed themselves of the opportunities offered, their Shareholders might at this time be receiving eleven and a quarter per cent. Still, we must acknowledge that there are some who prefer what they call a "safe" ten per cent. to the additional advantages which might be gained by a resort to the sliding scale. In the case of the London Company, the ten per cent. is perfectly safe; but, after all, it must be remembered that before many years are over it will be necessary for them to go to Parliament for more money, and then we know what will happen. The measure they now have before Parliament does not, as our readers know, make application for additional capital; so for the present, and for two or three more years, the London Company will be free to make a safe ten per cent. Presently, perhaps, the Shareholders will become alive to the advantages of the sliding scale, and put some pressure upon the Directors, and induce them to seize a chance which will enable the Proprietors to participate in some of the benefits which have accrued from the new order of things. We imagine we see signs that such a movement is not far distant. There were ominous hints thrown out at the last meeting of the Company, and other matters showed that the Directors might not be averse to the dissolution of the Company, if only a good opportunity presented itself. This opportunity may any day be afforded, and we are perfectly certain that no single Proprietor in the Company would regret the circumstances which brought it about. It certainly does seem deplorable to see a Company like the London lag behind, and not avail themselves of the advantages which modern gas legislation confers. We have said that the opportunity of combination might easily be found. The Company have been wooed on both sides of the water. They may unite with the Chartered, unless we are greatly mistaken, or they may combine with the South Metropolitan. We shall not presume to indicate in which direction their choice should lie; but this we may say, that union of some kind is essential to the welfare of the Company. Whether a northern or a southern combination would best conduce to the interests of the Proprietors, we must leave the Directors to determine; but we regard combination on one side or other of the river as essential to the best interests of the Company.

The electric light does not progress much in the Metropolis. The Société Générale d'Electricité recently made proposals to the St. James's Vestry (Westminster) to light up Regent Street, at a cost of 2½d. per lamp per hour. When, however, the Vestry examined the matter, they discovered that it would land them in the expense of laying a three-inch tube from the Charing Cross bridge to Regent Street. The expense of the new light, the Vestry have calculated, would have brought upon them a charge of £18 15s. per annum for each lamp which now costs them £3 1s. 4d. Little profit is likely to be obtained from a speculation of this kind, and we are by no means astonished that the Vestry have declined the Electric Light Company's tempting offer, conveyed through their Engineer, M. Gaudet. That gentleman must go where money is more freely expended, if, indeed, expended at all, and light the streets of Teheran on the credit of the Shah. It is wonderful to read that Mr. Edison has thrown up the electric light business, and gone off to California to extract gold from poor quartz; but there is a great deal to be done in this direction, and we have little doubt Mr. Edison will return to Menlo Park a richer man than if he had remained there and continued making carbonized paper horseshoes. In the meantime, other inventors will find an ample field for the exercise of their ingenuity. Mr. Edison having abandoned the business, leaves a fair field and "no favour" open to every one who is disposed to try his hand at the electric light. It is curious to see how few of the inventions have established themselves in the Metropolis. The Jablochkoff and Siemens systems appear to be the only two that have satisfied public opinion. These may be said to have to a certain extent established themselves in popular use, the former especially so. We shall, no doubt, presently be flooded with inventions; but "sufficient for the day is the "evil thereof." The electric light will continue to exercise the ingenuity of mechanical inventors, who will, no doubt, in time, succeed in making it some sort of success—a success, perhaps, superior to that of M. Jablochkoff; but we shall probably have to wait a long time before this is effected. What the Brush system may do when it comes to England we cannot tell; in America it seems to have had a great success. And perhaps the invention of Mr. J. M. Bois, who proposes to utilize the force of the Lower Falls of the Genesse River at Rochester, N.Y., will assist in extending its employment, and show that tidal rivers can be used in all countries to produce force. But the force generated by these falls is not intended to be employed exclusively for driving machinery for the production of the electric light. It is designed to supply motive force to all the machinery in the city, including the tramcars. This will be effected by means of a supply of compressed air, which will furnish the motive power, and at the same time distribute the force. We rather regret that compressed air is not more extensively used in this country. It might, we think, be economically employed in preference to steam or hydraulic power for the actuating of gas stoking machinery.

We publish to-day our usual abstract of the accounts of the Paris Gas Company. These, it will be seen, are presented in a form which greatly differs from those of our large Companies. Perhaps the accounts of the Manchester Corporation most nearly resemble them, but those of the Paris Company embrace a greater variety of detail, set out with much precision. The growth of the business of the Company since they obtained their concession has been little short of mar-

vellous; in the course of twenty-three years the consumption of gas having more than quintupled. When it is remembered that this large increase in consumption has not been brought about by any reduction in price—for gas in Paris is dear, and the Company do not reduce their charge—and that Paris does not grow with anything like the rapidity of our own Metropolis, we come to the conclusion that gas in the French metropolis is regarded as a necessary of life. In proof of this we may instance the continually increasing consumption for other than illumination purposes. Every year adds largely to the sale of heating and cooking appliances, and further to the disposal of gas-engines for the production of mechanical force. It is astonishing to see the large amount of gas consumed in Paris for this latter purpose. We wish we could get some idea of the quantity consumed in London for the same object, but only roughly approximate returns would be obtainable. Going out of our way for a moment, we may refer to the fact that some of the Syndical Chambers of Paris are agitating for a reduction in the price of gas; but, seeing that by an arrangement with the Municipality the Company share equally with them all the profits which accrue in excess of those sufficient to pay the Shareholders ten per cent., we do not think they are likely to succeed in obtaining a reduction. From the Company they might; but from the Municipality —never! Coke has been a difficulty in Paris, as everywhere else; but the Company appear to have cleared their yards by selling at very low prices. The loss on this residual is, however, to some extent compensated for by the considerable profits made on manufactured products. This result should encourage the Chartered Company, who, we believe, are succeeding well with the treatment of residuals. We do not, however, know exactly what they are doing, beyond the fact that they distil tar and manufacture sulphate of ammonia. Presently we hope they will imitate the Paris Gas Company, and commence the manufacture of artificial fuel, for which they must find a readier sale than their neighbours across the English Channel. The Company's artificial fuel-works have been in operation since 1873, and have brought them a very large profit, but nothing like what might be made by the Chartered Company at Beckton, if they undertook the business. Let us sum up. The total expenditure of the Paris Gas Company for the year reported upon was £1,790,000, and the receipts were £3,049,000; showing a balance in favour of revenue of £1,259,000. Adding the balance brought forward from the previous year, there remained a total of £1,263,000. Deducting the reserve to meet outstanding claims, there was a balance available for distribution of £1,256,000. Of this, after paying maximum dividends, a sum was left amounting to £760,000, divisible equally between the Shareholders of the Company and the Municipality. No wonder the Syndicates desire to see the price of gas in Paris reduced.

The sixth half-yearly meeting of the North of England Gas Managers Association was held at Newcastle-on-Tyne last Saturday, Mr. W. Ford, of Stockton-on-Tees, the President of the Association, occupying the chair. After the routine business had been disposed of, the Members and Associates took train to Jarrow, where, by the kindness of the Directors of the South Shields Gas Company, the new works were opened to their inspection. The centre of attraction was Mr. Warner's new stoking apparatus, which was at work, and the details of which were closely scanned. Mr. Warner read a paper on the subject, which was received with marked attention, and elicited considerable applause. The Members and Associates afterwards adjourned to the Railway Hotel, where an elegant repast was provided. Mr. Ford again occupied the chair, and was supported by the Mayor of Jarrow, Mr. Henderson and Dr. Armstrong, Directors of the South Shields Gas Company, and about sixty other gentlemen connected with the gas industry. Various suitable toasts were drunk, and a pleasant and instructive evening passed. A full report of the proceedings will appear in our next issue.

The more the use of gas is understood, the stronger becomes the interest of consumers in its employment, therefore we rejoice to see an eminent Engineer like Mr. W. Sugg going to Hull to deliver a lecture to the members of the Literary and Philosophical Society on the "Scientific Use of Coal Gas." The lecturer last Tuesday drew a large audience, and was listened to with great attention. Next week we shall probably be able to place the leading points of the lecture before our readers.

The Council of the Institution of Civil Engineers intimate that they have accepted, on behalf of the Students, an invitation from Mr. George Livesey, M. Inst. C.E., to inspect the works of the South Metropolitan Gas Company, Old Kent Road, where a concrete gasholder-tank of large size is now being constructed. The visit has been arranged for Friday next, at three p.m., at which hour the Students are requested to assemble at the works.

In the first list of gold medals awarded at the Sydney (New South Wales) Exhibition, the closing ceremonial of which took place last Tuesday, we notice the names of three firms connected with the gas industry in England:—Messrs. George Glover and Co., Chelsea; Messrs. Beverley and Wylde, Leeds; and Messrs. Lloyd and Lloyd, Birmingham.

Water and Sanitary Notes.

It is quite certain that Mr. Cross's Water Bill is now dead. Whether it will ever be revived or not depends upon circumstances over which, at the present moment, perhaps no one has any control. "New men, new measures." We can hardly suppose that with the advice of Mr. Fawcett any attempt will be made to carry out the provisions of Mr. Cross's Bill. It is, as we have said, dead; and, admitting the fact that some change is absolutely necessary in the present Water Supply of London, it remains to be settled upon whom the new arrangements shall devolve. So far as we have at present any evidence, the members of the Metropolitan Board of Works seem perfectly insensible as to the financial position they will be required to take. They are now made perfectly acquainted with the terms of purchase which the Companies will accept, and which have been looked upon as binding. The Government which has just escaped from office can never revive Mr. Cross's projected measure. It has gone over to "the majority," and there it will remain in limbo. Truth to say, Mr. W. R. Selway, at the meeting of the Metropolitan Board of Works last Friday, showed but little reason for any interference in Metropolitan water affairs. He candidly admitted that the Thames and Lea, although not perfectly satisfactory sources of supply, might be accepted as not unwholesome ones. We fail to see that much better sources could be found within any reasonable distance around the Metropolis. Chalk water is, of course, to be found within the Metropolitan area; but, apart from that, a full supply for the whole or half of the Metropolis is not to be expected. Say what we will, the water of the Thames and Lea must be resorted to for a continuous supply. It can always be relied upon, and the water is singularly constant in quality—no mean recommendation. We have spoken of Mr. Cross's Bill as lost, but there can be no reason why it should not be revived, and the late Government valuator, Mr. E. J. Smith, in a letter to Mr. E. J. Watherston, published in *The Times*, shows excellent reasons why, in the interests of the ratepayers, the Bill should still be carried through. He calculates that a large immediate saving will be effected, which will leave a surplus of profit available for public purposes; that this surplus will increase annually by substantial increments; and that at the end of twelve years the Metropolis will practically obtain the works for nothing. Under these circumstances, we say that as the Companies are satisfied with the bargain they have made, why should not the ratepayer be with the bargain made for him? It was made in all good faith and sincerity, Mr. Cross being anxious to do his utmost in carrying out the purchase.

Nothing, we fancy, is likely to come of any proceedings the Metropolitan Board of Works may be induced to take relative to the Metropolitan Water Supply. Their failure was so conspicuous when they before attempted to duplicate the supply, that we can see no reason for a belief that they will succeed better this time. Everything, of course, depends upon the view Her Majesty's new Government may take of the matter. It must be expected that for this year, at all events, they will not find time to go into the question unless they take Mr. Cross's Bill as it stands, hurry it through the preliminary stages, and send it to a Committee. Even then the deliberations of the Committee must be so prolonged that with the utmost diligence it will be found difficult to pass the Bill before the next prorogation. We have as yet had no decisive announcement of the desire of the ratepayers with respect to the water supply. We know they want a change, but perhaps they themselves hardly know of what that change shall consist. The quality of the water is impugned; and, strange to say, although a much more liberal supply is given than is furnished to almost any other town in the kingdom, complaints are made of a deficiency in quantity. On this score, however, the Companies are entirely free from blame. The Metropolitan Board, if they came into possession of the works to-morrow, could do no better. To remodel the water supply of the Metropolis would require active exertions extending

over at least ten years, and would cost many millions of money, which the Metropolitan Board might find some difficulty in raising. Putting all things together, we are inclined to agree with Mr. Runtz in thinking the Board had better leave the matter alone, and allow things to follow their own course.

The Glasgow Corporation Water-Works are not highly profitable; still, they bring a clear gain to the Corporation, which, however, is not large. The estimates for the current year will be found in another column, from which it will be seen that the Sub-Committee on Finance calculate upon having a surplus for the year 1880-81, after paying all charges, and setting aside £24,525 for a sinking-fund—being at the rate of one and a half per cent. upon the amount of money borrowed. The current rates of eightpence in the pound within, and elevenpence in the pound outside the limits of compulsory supply, are to be continued, together with a public water-rate of one penny in the pound.

The indebtedness of Local Authorities increases at a rather alarming rate. The Rochdale Corporation having borrowed £499,300 for water-works and sewerage purposes, now desire to raise further money to the extent of £75,000, making over half a million. An evident desire is exhibited to shirk, if possible, the formation of a sinking-fund. There are people in Rochdale who share the views of Alderman Chamberlain, of Birmingham, and think that when Corporations borrow money it should remain a permanent debt, owing by all posterity. There is something to be said on this side of the question, but Parliament does not share the view. Rochdale will, no doubt, get an extension of time before they are compelled to commence their sinking-fund, but we imagine that a commencement must sooner or later be made.

An alarming outbreak of typhoid fever, which has occurred at Perth, is ascribed to an irruption of the unfiltered and polluted water of the Tay into the pipes conveying water about the town. An investigation has been ordered, and samples of the water have been sent for analysis; but after all this trouble has been taken we may possibly be told that the outbreak came of infected milk. At all events, it appears that over four hundred of the inhabitants are laid up, and require the attendance of some eight doctors. Here is a chance for an enterprising correspondent to write to the newspapers that the cause of the death of the victims of the Tay Bridge disaster was sewage poisoning; but then we may refer them to the case of the Munich doctor we lately noticed, who cured a number of his patients by administering to them the filthiest of concentrated sewage.

INDUSTRIAL NUISANCES.

It is a matter for much regret that so many of the industrial enterprises of the age should be subject to the charge of injuriously affecting the health of the community, or of the parties more immediately connected with these undertakings. There seems to be something anomalous in the circumstance that wealth and wages should thus aggravate the sicknesses of mankind, and shorten the duration of human life. There is, indeed, a brighter side to the question, and one which seems to carry with it the lesson that it is not the trade which kills, but the blunders which are committed in carrying it on. The primary consideration is to get a profit. The sanctity of human life appears as a subordinate consideration. First of all, there is the industry—whether mining, manufacturing, or trading. Secondly, there is the nuisance, either in the form of conditions unfavourable to the habits of those engaged in the work, or hurtful to others dwelling in the neighbourhood, and possibly injurious to both. Thirdly, we reach the stage at which the sanitary evils have arrested attention, and efforts are then made to reconcile the interests of trade with the rules of health. England has struggled into the third stage, and a striking illustration of the condition of things is afforded by the reports which embody the researches of Dr. Ballard on what are called "the effluvium nuisances arising in "connection with various manufacturing and other branches "of industry." These reports have their place in the annual volumes of the Local Government Board, and in the Blue-book just issued by that department the inquiry appears to have come to an end.

From his concluding remarks, we learn that in the course of his investigations, commencing in 1875, Dr. Ballard has visited more than 850 separate trading establishments, distributed over nearly all parts of England and Wales, and a few of them in Scotland and Ireland. In very many of these establishments, if not in the majority of them, more than one offensive process was being conducted. Dr. Ballard states, as worthy of special notice, that only on five occasions has he been denied the privilege of examining any works which he desired to inspect. The works which were thus closed against the Government Officer were of comparatively small magnitude, and the denial was susceptible of explanation on the ground that either the proprietors had within a recent period been prosecuted for nuisance by the Local Authorities, "or "had been irritated by the injudicious interference of their "technically uneducated officers." In all other instances Dr. Ballard, when he had explained his object, was welcomed, the proprietors or the managers conducting him through their works, and taking "infinite pains" to explain the details of their processes. These parties freely, and in some cases repeatedly discussed with Dr. Ballard, in the most unreserved manner, points of leading importance as relating to his inquiry. Such testimony shows that the parties who are carrying on these industries either have confidence that they are already doing their best to conduct their trades without offence, or are ready to adopt any reasonable plan for mitigating or remedying such evils as exist.

The scope of the present report is a wide one, and the report itself is extensive, occupying not far short of three hundred pages. The manufacture of coal gas comes under review, the special features attended to by Dr. Ballard being illustrated by the aid of photography. This portion of the inquiry will be treated in our columns in a separate and distinct form, and will not be further adverted to now. What is called the "manufacture of horsehair" furnishes a curious chapter. There is the horsehair proper, obtained from the manes and tails of the equine race, in addition to which there is cowhair and pig's hair. These materials are manipulated at sundry establishments, so as to be fitted for various purposes, such as the manufacture of horsehair cloth or seating, the stuffing of chairs, and the production of brushes. The manes and tails of horses are obtained from England, South America, Australia, and Russia. The best horsehair comes from English stables, and the dirtiest pig's hair is from Germany. A lamentable danger exists of fatal disease being communicated by the dusty matters given off when hair is infected with what is called anthrax, or Siberian plague. The principal source of danger, as implied by one of the designations, exists in the use of Siberian manes. The risk in this respect besets the workpeople at every stage up to the time when the hair arrives at the dye-vat. The infected dust is even capable of carrying the disease to parties outside the works. Evidence to this effect is afforded in a report by Dr. Russell, the Medical Officer of Health for Glasgow. The dust collected in the dusting machine is sometimes transmitted to a distance to dealers in manurial matters, doubtless with risk to the parties thus concerned. It is further suggested that some of the mysterious cases of blood poisoning, occasionally met with in London and elsewhere, may be due to poisonous hair-dust. It is some comfort to know that the dyeing process, owing to the heat employed and the materials used, affords a complete disinfecting process. Otherwise serious suspicion might attach to sundry articles of furniture.

A kindred subject to the above is afforded by the rag and bone industries of our large towns. We are reminded that in London the rag and bone shop is not always content to hide itself away in a back street, but, in some instances, comes to the front, so as to be seen in large thoroughfares. Metropolitan marine store dealers not only purchase, store, and retail old metal of any kind, glass bottles, crockery, and the like, but almost any description of domestic refuse, including grease, bones, and rags. Peculiar peril attaches to the rag business, and we should expect to find that the mortality among these traders was especially high, though we are not certain as to the figures. The marine-store dealer seems to revel in old clothes and discarded shreds. It is chiefly with these that he blocks up his front shop, his back parlour, and the yard outside. Then there is the odious fat, the indescribable kitchen-stuff, and the grease of all descriptions, together with the mouldering bones, all combining to create a deadly smell, which, when the house is closed at night, would seem enough to kill the inmates. To the public the rags are especially obnoxious. These come from all quarters, are brought without any sanitary considerations to govern the transaction, and, doubtless, in many cases, abound in "germs," or whatever else may be supposed to constitute the proper vehicle of infection. Such "stores," we are told, must be a constant source of danger to "lodgers" and passers-by, especially when dust, arising during the sorting of the rags, is carried by the wind outside the house. We may bid the public, "Beware of the black doll." It may seem almost ludicrous, but it is no less lamentable, that on one occasion a coroner's jury in St. Giles's declared in their verdict that the death of a man was accelerated by the foul effluvia from a rag and bone shop next door.

Bye-laws from the Metropolitan Board and the Urban Sanitary Authorities are to be our protection against the marine store dealer. But who is to protect us when the Urban Sanitary Authority itself goes wrong? Dr. Ballard denounces the dust-bin, the dust-cart, and, more or less, the dust-yard. The "Authority" itself has its rags, its bones, and its marine stores. We read of "offensive heaps of town "refuse," examples being given at Plymouth, in 1875, and at Lancaster, in 1876. We have a graphic picture of a London dust contractor's yard, and the dust-yards appertaining to the Vestries, when the latter undertake—as some of them do—their own "dusting." We are told of the "soft core" and the "hard core," as well as the "breeze," and the ashes. The manipulation of the refuse is an offensive process, and has in some cases led to legal proceedings. Nauseous odours are given off, and unwholesome dust flies about. Of the latter we have a notable instance in respect to the dust-yard which sent unsavoury particles into the reservoirs of the Southwark and Vauxhall Water-Works Company some years ago. The nature of the material, says Dr. Ballard, was "indefinite," but at any rate it "might" have contained something infective. The London "dusting" is a big business. One contractor, having a wharf in the Paddington Basin, stated in a recent trial that he alone sent away by canal 57,000 tons of refuse in a single year.

Brick-burning is a nuisance which haunts the suburbs of London. It is necessary to have bricks, if houses are to be built; but, if we could have the bricks without any preliminary nuisance, it would make life happier to a good many people. Dr. Ballard goes into the mysteries of clamp burning and kiln burning, introducing us to the nomenclature of "cutters," "yellow seconds," "pickings," "paviours," "common stocks," "grizzles," and "place-bricks." This is a descending scale, and we should like to know exactly what kind of article a "place-brick" can be, as well as the reason why it has such a semi-political designation. London has the ill luck, or the good luck, to have a quantity of brick-earth round about it, and this, we presume, facilitates building operations which are so rapidly swallowing up market gardens and fields. A great part of London has passed through the pug-mill, and the "outer ring" is growing by virtue of the same process. Brick-burning is recognized by Dr. Ballard as a very common cause of nuisance, burning in clamps being especially offensive. "About London," it is stated, "in new neighbourhoods where brick-earth is dug on "the spot, and bricks are made for use on the spot close "to inhabited houses, the nuisance is notorious, and has "frequently given occasion to legal proceedings being taken "to bring about its suppression." Volatile empyreumatic matters of organic origin, "probably in some variety," combine to create the offensive odours chiefly given off in clamp burning, and this element of offence varies with the nature of the clay. It happens that the London and Kentish clay is particularly disagreeable in this respect, and matters are made worse by the dreadful rubbish mixed up with the fuel. Clays of the older geological formation can be burned without offence; but, despite the defects of the raw material, there would be a vast improvement in the state of things round London if a suitable kind of fuel were used. Another nuisance consists in the burning of stiff clay into what is called "ballast." Where building operations are going on, the clay that is dug out is burned into the condition of "ballast," in order that its removal may not be the occasion of pecuniary loss. Where an estate of several acres is being covered with buildings, the production of "ballast" is a somewhat important piece of economy. Some care, however, ought to be taken to avoid the infliction of a nuisance on the people who have been tempted to take up their abode in the suburbs, hoping to breathe a purer air than is to be found in the heart of London.

Dr. Ballard might have said something about the pungent vapours given off during the burning of weeds, a species of suburban nuisance almost equivalent to the burning of bricks in clamps, or the production of ballast. There is also the travelling furnace of the locomotive, which of late years has plagued many a pretty spot with smoke made "stickable" with steam. But these are subjects probably outside his ken, and Dr. Ballard certainly finds abundant material while keeping within the letter of his instructions. The smoke nuisance presents itself very forcibly in relation to the manufacture of Portland cement. The effluvia from cement works is partly that of ordinary coal smoke, but complaint is especially made of an odour, more or less powerful and offensive in its character, resembling that which arises from clamp brick-burning about London. Cement works generally throw out large volumes of smoke and vapour, sufficient to cloud the air and obscure the view, and sweeping at a low level over a considerable tract of country. At Southampton, persons residing at least a mile from the works were found to complain of the nuisance quite as much as, or rather more than those dwelling in the immediate vicinity. Dr. Ballard states that a medical man, whose testimony he can implicitly rely upon, and whose practice is extensive enough to include Northfleet, where some of the largest cement works in the kingdom are situated, and where the atmosphere is commonly charged with the emanations from the works, has noticed, since the establishment and extension of these works, "a marked deterioration in the "general health and aspect of the population." The people do not, he says, as was formerly the case, bear the robust appearance of country labourers, but are generally pale and pasty-faced, and diseases have altered to a lower type than was customary when first he knew the place. This gentleman adds that the depression of health which he has observed is greater in extent than would be accounted for by the other conditions which have been associated with the increase of the population in the thirty-five years during which he has known the neighbourhood. Nevertheless, the cement trade, in common with others, has its capabilities of improvement, and in various parts of the kingdom the nuisance is being abated.

Potteries are well-known sources of annoyance. There is not only smoke from the fuel, but there are acid vapours from the process of salt glazing. Still, it is found perfectly practicable to reduce the smoke nuisance in a very considerable degree, and proof to this effect is afforded by a change for the better in the air of the pottery towns in North Staffordshire. Lime-burning gives off smoke and poisonous gases. The manufacture of coke and breeze does much to load the air with smoke and fumes. Mr. J. Lowthian Bell computes that, in addition to the smoke, the coke-ovens in the county of Durham annually discharge into the air between 60,000 and 80,000 tons of sulphurous acid. This occurs not generally in the county, but in sundry limited areas where the industry is carried on, and where the nuisance is therefore concentrated. The breeze-ovens in the neighbourhood of Dudley are especially guilty of producing smoke. In fact, we are told, "These "ovens, for their size, produce more smoke at a low level than "any other business carried on in the Black Country." The burning of "spoil banks" in the colliery districts adds to the general pollution of the atmosphere. The firing of these banks is said to be often spontaneous; but whether this be so or not, the annoyance produced is no small matter. The smoke and fumes are described as "copious, very disagreeable, sulphurous, "and suffocating." When the heap is near the dwellings of the people, the nuisance is sometimes such as to render the houses quite uninhabitable, if the wind brings the smoke in that direction. "Under such circumstances," says Dr. Ballard, "people have had to get up in the night and leave their "houses."

We might pass through a long list of trades accused of creating nuisances, but for the present we cannot go into the details relating to them. Thus we have brought before us the manufacture of sulphate of ammonia and sal ammoniac, the distillation of tar, the dipping or varnishing of iron pipes, the manufacture of artificial or patent fuel, of asphalte, of lamp-black, of carbolic acid, of aniline, and of aniline colours, as well as the distillation of oil shale, the preparation of paraffin, the manufacture of sulphuric acid, of salt, of alkali, of bleaching powder, and of glass, together with the calcination of ironstone and tap cinder, the calcination of arsenical ores and the refining of arsenic, copper smelting, lead smelting, the refining of gold, and numerous other processes. A wide range is thus travelled over, and many of the facts are very interesting. Upon the whole, the review is a hopeful one. If a hundred years hence all the trade nuisances which now exist in England are fairly got rid of, and no new ones arise to take their place, the reader who happens to live in that happy period, and gets hold of these reports, will be led to wonder how people endured the state of things thus portrayed. Certainly, human existence is not altogether so pleasant as it ought to be in the midst of the civilization of the present age, and thousands of lives must lose their due share of enjoyment through the presence of evils which only require for their removal a reasonable amount of care and expenditure. In other words, our current civilization is partial, and needs development in certain neglected particulars. We have killed off the wolves, and pretty nearly extirpated the highwaymen; but we have set up smoky chimneys, and scourged the country with chemical vapours, whereby we have grown rich on the one hand, and impaired the sources of enjoyment on the other.

WATER ANALYSIS.

The recent publication of Dr. Frankland's convenient little volume on this subject;* the important memoir by Dr. Tidy read and discussed last year before the Chemical Society, and published in its *Journal*;† and the volume published as long ago as 1868, and now appearing in a fifth edition, by Professor Wanklyn and Mr. Chapman,‡ in which Dr. Frankland's title was anticipated, contain the literature of a subject which has of late years assumed extreme importance, but concerning which there is a haze of mystery and obscurity that assuredly ought not to exist. It is certainly very much to be regretted that there is no common and recognized method of procedure in this department of chemistry, but it is almost discreditable that not only are the results of analyses given in discordant chemical expressions, but even the figures are not in the same terms, so that a comparison of results is impossible without performing an arithmetical operation. So long as one chemist expresses his results in 100-1000th parts, another in grains per gallon, and a third in milligrammes, or parts in a million; while one estimates ammonia as a total, another separates free from organic ammonia, and the third regards the quantity of what is called albumenoid ammonia as of vital importance; while one adopts the combustion or evaporation method to determine the actual quantity of organic contents of water, and another accepts the permanganate method to discover the quantity of oxygen required to oxidize the organic matter present; it is evident that the comparison of analyses effected by the pupils of the various schools cannot be satisfactory or conclusive, because they cannot be compared. Surely the time has come when methods of analysis giving the quantity of organic carbon and nitrogen and its condition or history in some intelligible form, the quantity of nitrogen as nitrates, the quantity of chlorine, and the hardness, in similar terms, should be so far agreed upon that results can be compared, and those who are not chemists will then be able to form some opinion as to facts. We believe all our most distinguished chemists would agree that this is possible. It only needs that each should give way in some matters that are not essential, but rather belong to the individual. Dr. Tidy well and properly observes in his paper (*Journal of the Chemical Society*, Jan., 1879): "I am afraid the public *have* taken note and *are* taking note of chemists differences, and distrust our work accordingly. Nor indeed is their distrust to be wondered at, deeply as it is to be lamented."

In Dr. Frankland's book we find stated, in a compact and convenient form, the requirements of a water analysis, and in an appendix examples of typical analyses. He begins by pointing out the fact that complete and ultimate analyses are by no means called for in ordinary cases. He points out the unimportance, in a sanitary sense, of the dissolved gases, which vary but little in waters of very different kinds, and of which the presence of a smaller or larger quantity does not affect the goodness of the water; the difference, in fact, lying chiefly in the quantity of carbonic acid. The separate estimation of the quantity of each of the saline matters and of each organic constituent of the suspended matters, may in like manner, and for the same reason, be omitted. The processes adopted to determine the quantities of inorganic solids, the ammonia, the chlorine, the nature of the hardening ingredients, and the presence of poisonous metals, if any, are those which are really important, and a knowledge of them and of the amount of nitrates, and lastly, but of chief importance, the means of estimating approximately the proportion of the organic elements in a sample of water, are the objects to which attention is really required, and to the elucidation of which the volume is dedicated. Professor Frankland considers that there is no process, short of the actual combustion of the organic matter present in water, which affords thoroughly trustworthy evidence of the organic carbon and nitrogen, and of the fitness or otherwise of the sample for dietetic purposes. The "ignition" and "albumenoid ammonia" he merely mentions, and evidently disregards. The former is described by Dr. Tidy in his memoir, and he considers it is not satisfactory, as failing to show that, in carrying out the process—(1) no organic matter is lost, (2) that all the organic matter is burnt off, and (3) that no organic matter is added. Notwithstanding this, he adopts it in the analysis of sewage, and thinks that in some respects it may be indicative, and suggestive in other cases. The ammonia process, described by Mr. Wanklyn as "a sort of combustion process, with ammonia for the ultimate product," has for its object the comparative determination of the nitrogenous organic matter by the quantity of ammonia yielded by the destruction of the organic matter, this quantity being called "albuminoid ammonia." (Wanklyn's "Water Analysis," 5th Ed., p. 31.) Dr. Tidy has considered in detail the advantages and disadvantages of this method, and has given some remarkable illustrations of its failure in important cases. He points out the very important fact that the quantity of albumenoid ammonia in peaty water is very large, although it has never been proved that such water is in any sense injurious; and, on the other hand, that in waters regarded by Mr. Wanklyn as exceedingly bad, the albumenoid ammonia is almost *nil*. For these reasons apparently, as he quotes Dr. Tidy's paper and gives no other reference, Dr. Frankland rejects them.

In the commencement of his work, following Mr. Wanklyn in this, Dr. Frankland describes the preliminary considerations in water sampling, the quantity required, and the tests that should be applied to determine the presence of mineral poisons, the nature of refuse from manufactures, the action on soft lead, and the cause of turbidity. Having thus opened the subject, he proceeds to show in what way the total solids in solution can be best determined. To determine the organic contents, he prefers the combustion method. He describes the precautions required in evaporation, and believes that "the proportion of solid residue left on evaporation affords an approximate, though somewhat rough indication of the comparative purity of water." This, no doubt, is true in a certain sense, although it must not be concluded that waters showing a large residue are necessarily bad. It is with water as with many other things, we must be content with the best we can obtain under existing circumstances, and absolute purity is practically unobtainable. A tolerably good river water at hand is often better than deep well water or lake water from a distance, though theoretically superior.

In speaking of quality, Dr. Frankland adheres throughout to the strict technical use of the words "impurity" and "pollution," applying them to all foreign substances present in water. This is to be regretted, as they are eminently misleading when referring to the quality of water for ordinary purposes, and are certain to foster prejudices both unfair and mischievous. According to his use of these terms, all mineral waters, including those especially recommended for dietetic purposes, might be quoted as exceedingly impure, and loaded with polluting matter.

The determination of the ammonia is the next point considered. It is admitted that the actual quantity of ammonia present is, of itself, no guide to the purity of the water, as there are many cases of deep-well water in which the quantity is large, though there has been no access of animal matter. As, however, ammonia in water is very commonly caused by animal matter in a state of incipient decomposition, and is found in water polluted by sewage, in shallow well water, and in some cases in river water, the quantity present in a given quantity of water is regarded as an essential inquiry, and its presence is suggestive of evil.

Chlorine is present in water chiefly as a constituent of common salt, and this is so uniformly found in the liquid excrement of animals, that its presence in water is also to be distrusted. At the same time, a certain quantity is certainly washed out of the air and soil by rain, although the proportion of this is not constant. The quantities allowed by Dr. Frankland as due to these causes are 0·22 parts per 100,000 for rain water, 1·13 for upland surface water, 2·49 for spring water, and 5·11 for deep-well water. The history of the water must, therefore, be known before its value can be ascertained. It is evident that there are special cases in which these quantities are enormously exceeded without danger.

The estimation of nitrogen as nitrates and nitrites is not difficult, and may be effected in one of three ways. Each is described at some length in Dr. Frankland's book, and each has its own advantages. He prefers that which involves the decomposition of the salts into nitric oxide, and the measurement of the gas evolved.

The methods for determining hardness that are suggested involve nothing new, and they have been too often described to require notice here.

The method of determining organic purity by the use of permanganate of potash, originally suggested by Professor Forchhammer in 1850, approved by Dr. Miller and other eminent chemists, and brought into use by the late Dr. Letheby, has been perfected by Dr. Tidy, and appears to produce results so satisfactory, as compared with the combustion process, when carried on under the most favourable conditions, that Dr. Frankland admits its usefulness and general accuracy in waters of moderate purity. It is elaborately described by Dr. Tidy in his memoir, and its advantages are discussed. The prominent objections to the combustion process, which is still regarded by Dr. Frankland as the only secure method of determining the organic elements, will also be found fully stated in that memoir.

It must not be supposed that the analytical determination of the foreign substances present in water is sufficient to justify a conclusion as to the quality of the water without a due consideration of all circumstances, not only those indicated by the association of the elements, but those under which the water has or may have acquired them. No chemist, however able and intelligent, is justified in giving an opinion as to water submitted for analysis without knowing the history of the water, except, of course, where there are definite poisons present which enforce an absolute condemnation.* Neither the ammonia nor the nitrogen, neither the salt nor the hardness, may be regarded alone, without reference to this history. Thus it is that while mere analysis is easy, the estimation of waters for sanitary purposes must always require very great judgment as well as long experience.

Dr. Frankland gives in an appendix a number of typical analyses of waters of various kinds and of various qualities. Adopting a classification suggested originally by Dr. Parkes, and modified by Dr. Tidy, he groups all waters into two sections—upland surface waters, and waters other than upland—and each section he divides into four classes—viz., waters of great purity, of medium purity, of doubtful purity, and of no purity at all; determining the value in each case by the permanganate process. This classification may be useful in some cases, but it is hardly of general application, inasmuch as "upland surface waters" is a very vague expression. The analyses given in this appendix are valuable, and are, we believe, chiefly

* "Water Analysis for Sanitary Purposes, with Hints for the Interpretation of Results." By E. Frankland, Ph.D., F.R.S., &c. London: Van Voorst. 1880.

† "The Processes for Determining the Organic Purity of Potable Waters." By C. Meymott Tidy, M.B. *Journal of the Chemical Society*, Jan., 1879.

‡ "Water Analysis: A Practical Treatise on the Examination of Potable Water." By J. Alfred Wanklyn, M.R.C.S., and Ernest Theophron Chapman. London: Trübner and Co. Fifth Edition. 1879.

* It is well that this should be borne in mind by engineers and others who occasionally send waters for analysis with merely a number or other private reference. It is not fair to the chemist to require an opinion as to the goodness of water, without communicating its source and the circumstances under which it has been obtained. Generally the chemist should take the sample himself.

quoted from the celebrated Sixth Report. We venture to suggest that they would be less liable to misconstruction if the estimate of what in this work Dr. Frankland still calls "previous sewage contamination" were left out. This expression is, no doubt, explained (see pages 95-98), as it has often been, and to those who understand the explanation it really means nothing that in any way affects the value of the water; but when we are told that rain water falling in London on Nov. 8, 1873, contained 1490 parts in 10,000 of this mysterious essence—that the deep-well water from the magnesian limestone contains, on an average, nearly ten times as much, and the upland surface water from the lower London tertiaries none at all, we confess to a feeling of wonder that so misleading a title should continue to be used in reference to waters whose real value for dietetic purposes is not, and cannot be, in the smallest degree, influenced by so ugly an expression. The term has been withdrawn from the official returns describing the state of the London water, and it would be well if it could be expunged from the literature of analytical chemistry.

We have already alluded to some of the reasons of Dr. Tidy for rejecting Mr. Wanklyn's "albuminoid ammonia" process, and have pointed out that they are fully recognized by Dr. Frankland. This method is, however, by much the easiest of all for determining the organic constituents, and for that reason is very widely adopted. It is described in detail in Mr. Wanklyn's volume already referred to, and one of the means of determination involves the precise comparison of shades of colour. A possibility of personal error is thus introduced, which detracts very seriously from the value of a method which appears in other respects to be doubtful in its conclusions. We are not aware that Mr. Wanklyn has replied to the objections to his method, but we observe that he still adopts it in his determination of the organic contents of doubtful waters. The best, easiest, and safest method of estimating organic matter is, no doubt, the great problem to be solved in water analysis; but as it is not agreed whether the combustion process, the permanganate or oxygen process, or the albuminoid process, is the right one,* it would seem reasonable that in all cases of dispute the analytical chemist on each side should be expected to give his results, not only in the way he thinks best, but also in the terms adopted by his *confrère*, and in such form that they admit of immediate comparison. If no other agreement can be arrived at, we may at least expect so much, and we think that in time it might be found possible to obtain, by common consent, a middle way that should satisfy all parties. At any rate, and first of all, there might be a consensus in the matter of arithmetic.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

PUMPING GAS AT BECKTON.

SIR,—You describe and illustrate very clearly, in the last number of the JOURNAL, the No. 5 exhauster-house and machinery at Beckton. Kindly permit me to mention that the building, with its elaborate foundations and other accessories, for housing-in Messrs. Donkin and Co.'s exquisite engines and exhausters, was designed and erected, in the usual routine, for this Company by me.

V. WYATT, Constructing Engineer.

The Gaslight and Coke Company,
Beckton, North Woolwich, April 22, 1880.

SIR,—In the JOURNAL of yesterday, which I received this morning, I observe there is an article on "Pumping Gas at Beckton for Distribution in London;" and it is therein stated that "it is believed to be the first instance of gas being supplied direct to the consumer by pumping." This, however, is not the case, for in 1876 this subject engaged my attention. The works of this Company at Linacre are situated some distance from Liverpool, and, in fact, are our local "Beckton;" and most of the gas made there is transmitted for distribution to other works in various parts of Liverpool by means of a large connecting-main, so arranged as to allow the gas to pass directly to the consumers. In consequence of the increasing demand for gas, it was decided to enlarge the power of this main by means of pumping machinery at Linacre, which I determined should be of such a character as to permit of the gas being sent directly from the exhausters, or rather pumps, to the distributing mains; and in April, 1878, an order was given to Messrs. Gwynne and Co., of Essex Street, Strand, to erect two non-condensing single-cylinder engines, each having a crank-shaft with double bearings, to which there are attached direct two 63,000 cubic feet per hour exhausters, thus giving a total power of 252,000 cubic feet per hour.

I enclose for your inspection a plan of the exhauster-house, with boiler-house attached, in which are fixed two of Galloway's patent boilers (with space for a third); and it will be observed that the arrangements at Beckton are, except as regards size, almost an exact copy of the machinery at Linacre. On giving the order to Messrs. Gwynne and Co., they informed me that the arrangement I had designed was the first of the kind they had undertaken.

In conclusion, I may observe that the machinery has worked very satisfactorily, the gauge on the outlet hardly showing any perceptible oscillation, and has in all respects accomplished the purpose for which it was designed; and that Messrs. Gwynne and Co. are now duplicating the apparatus, so that next winter a forcing power of 504,000 cubic feet per hour will be ready for use. Having solved this problem satisfactorily at Linacre, I am glad to find that my friend Mr. Trewby has copied it at Beckton—for I cannot admit the novelty of his arrangement—and there is every reason to believe that, as you remark in your article on the subject, the system may come into general use.

WILLIAM KING.

Liverpool United Gaslight Company,
Engineer's Office, Duke Street, Liverpool, April 21, 1880.

[The plan referred to by our correspondent, together with drawings of the engines and exhausters which Messrs. Gwynne and Co., as they state in a letter which we print below, have kindly furnished, are in the hands of the engravers. In an early issue we hope to publish them, together with a more extended notice of the apparatus referred to in Mr. King's letter.—ED. J. G. L.]

SIR,—Referring to the engraving in the JOURNAL of the 20th inst. of the apparatus for pumping gas from Beckton to London, said to be designed by Mr. G. C. Trewby, and manufactured by Messrs. Bryan Donkin and Co., we confess that the description applying to the same has created in our minds no little surprise, inasmuch as we patented this very arrangement in December, 1871 (as a reference to our patent No. 3449 of that year will prove), and the patent was taken out by us at that time with the object of accomplishing what is now claimed as a novelty.

In the early part of 1876 we made a great many experiments on exhausters (single, double, and treble, and their various combinations), and we then found that our patent of 1871, which has been copied at the Beckton works, and is an infringement, did not accomplish to our satisfaction the object we had in view. As a result of these experiments, we patented again in August, 1878, a new system of securing absolute equality of pressure in gas exhausting and pumping machinery. Some of the Engineers of The Gaslight and Coke Company inspected our apparatus at work in 1876, and, singularly enough, this same Company had our new system in operation in two of their establishments several months prior to the erection of the machinery by Messrs. Donkin and Co. at Beckton.

Mr. W. King, C.E., Engineer to the Liverpool United Gas Company, was the first gas engineer who had the courage to try on a large scale our new system of exhausting and pumping. In 1878 we erected for that gentleman at the Linacre works a complete set of exhausting and pumping machinery to convey the gas to Liverpool, direct to the consumers, in a continuous supply, absolutely free from oscillation, and this is what has never yet been accomplished, unless by ourselves—the Beckton arrangement not excluded, although our early system has been copied. The machinery has been in use at Linacre for over twelve months, and, we believe, has thoroughly and satisfactorily answered all the intentions of Mr. King. We are at the present moment constructing a duplicate set for the same establishment, and we shall do ourselves the pleasure of supplying you with a set of drawings showing the arrangement that we there adopted. The Linacre Gas-Works under Mr. King's charge are, therefore, the first in this country that adopted our new system, and to Mr. King is due the credit of first realizing the advantages to be obtained by carrying into practical working the non-fluctuating invention secured by our patents.

GWYNNE AND CO.

Essex Street Works, Strand, W.C., April 22, 1880.

P.S.—We have erected several other sets of our patent non-fluctuating machines at gas-works, where they are working most satisfactorily. Detailed particulars will be sent with our drawings.—G. AND CO.

THE BRAY LANTERN AND BURNER, AND MR. SUGG.

SIR,—I had hoped that the correspondence on this subject would have been closed with my last letter; but I cannot allow Mr. Bray's communication, appearing in your issue of the 20th inst., to pass unanswered, and I trust you will give me an opportunity of publishing my reply.

I say that Mr. Bray's lanterns and burners, so far as there is any similarity between his and mine, are copies of my inventions; and, so far as they differ from mine, they are only adoptions of old ideas.

My "shadowless lantern" was registered in January, 1879, in pursuance of the Designs Copyright Amendment Act, under the head "Useful." Mr. Bray's lantern was patented in April, 1879, nearly three months later. I send you a drawing of my registered "shadowless lantern" as I exhibited it recently at Birmingham, and I ask any one of your readers to compare this with the specification drawings of Mr. Bray's lanterns, and (remembering the earlier publications of mine) say whether mine are copies of them, or whether Mr. Bray has copied mine, so far as the lantern itself is concerned.

And here I have to inform you, Sir, that the drawing of Mr. Bray's lantern, fig. 3, p. 601 of your last issue, is *not* what it is stated to be—viz., a copy taken from the specification of Mr. Bray's first lantern patent—but an *altered* copy. The object of the alteration can only be to mislead your readers, and, therefore, I beg that you will, in justice to me, publish the *real* specification drawing alongside that of my flat-flame lantern, in order that they may be able to make the comparison I have spoken of.

The improvement in my hollow-top steatite burners is properly described in my patent specification. The original hollow-top steatite burners I gave to the public years ago, and they were generally in use long before Mr. Bray took out a patent for burners. There are thirteen sizes of them, and my No. 12 will consume nearly as much gas as, and give better results than those used by Mr. Bray in his quadruple-flame lately shown at Birmingham. But, apart from this, are two burners, in other respects alike, not imitations, because one happens to be larger or smaller than the other?

The combination of burners is no novelty. I could point to lanterns in many parts of the kingdom (and I have no doubt your readers could also) in which several flat-flame burners have been combined to give one strong light. In particular, I myself put up several combination burners on the Beckton pier some years ago. They were composed of four hollow-top steatite flat-flame burners in one lantern.

The gauze at the bottom of the lantern is also old. It is used in the lamps at the East India Docks for the very purpose of steadying the flames of the lamps in exposed places, and at the same time to allow a free supply of air.

The only thing now left is the arrangement of vertical tubes. When

* We have not alluded in these remarks to Mr. Wanklyn's "moist combustion process" recently introduced. It is described in the last edition of his book, p. 53; but, inasmuch as he has thought it right to protect it by letters patent, it has no value for general application.

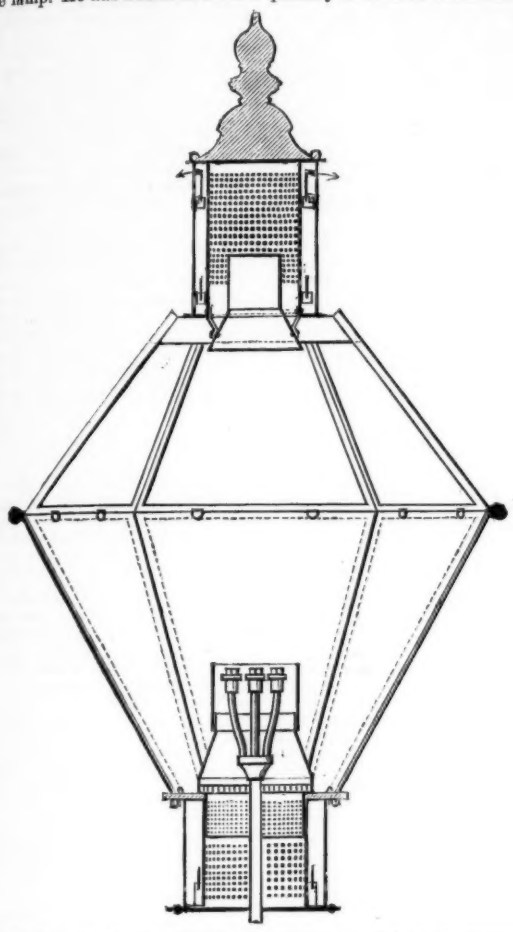
I ventilate from the bottom of the lantern I use one tube instead of several. What novelty or advantage does the latter possess, except that of greater expense and trouble?

In conclusion, Mr. Bray has adopted my lantern even to its very ribs and reflectors. He has adopted my hollow-top flat-flame burners under another name. He has adopted the well-known principle of combining burners. He has adopted the old wire gauze protection at the bottom of the lamp. He has added to these a quantity of vertical tubes instead of one. And he patents this amalgamation of adopted ideas, and then accuses me of having infringed his patent.

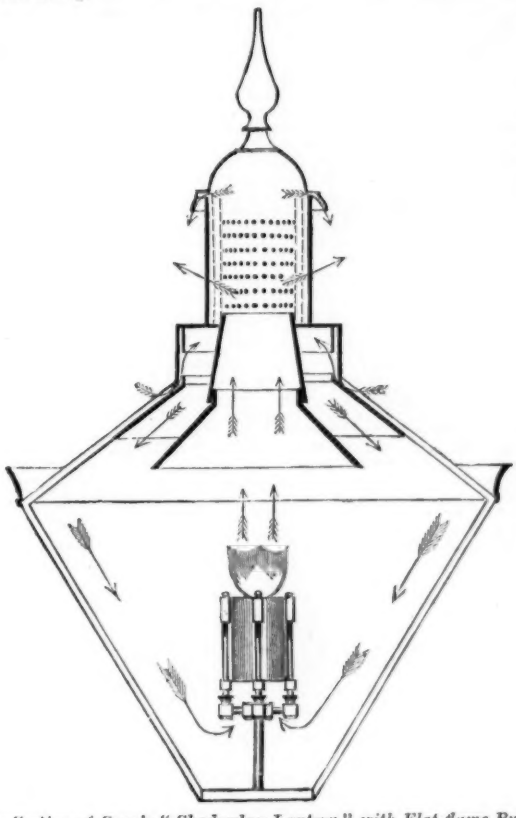
I leave the matter to the good sense of your readers and to the arbitrament of the Courts of Law, if Mr. Bray persists in his declared intention.

Vincent Works, Westminster, S.W., April 24, 1880. WILLIAM SUGG.

[It is right to mention that the drawings of Mr. Bray's lanterns and burners, given in last week's issue, were copied from tracings with which Mr. Bray himself supplied us, together with the description of them we published. We have, however, had another illustration prepared *from the drawing in the patent itself*, and give it below, together with an illustration of Mr. Sugg's registered "shadowless lantern," in order that our readers may make the comparison our correspondent asks for. —ED. J. G. L.]



Cross Section of Bray's Lantern and Burner; copied from Drawing in Specification of Patent (No. 1454) dated April, 1879.



Cross Section of Sugg's "Shadowless Lantern" with Flat-flame Burner, as shown at Birmingham, March 10, 1880; registered January, 1879.

THE MANUFACTURE OF SULPHATE OF AMMONIA.

SIR,—In reply to the letter of Mr. Jones in your last issue, I will simply ask him a few questions, and if he will answer them I shall be perfectly satisfied.

1. Is it, or is it not, the fact that the flue connecting the saturator with the chimney was in the habit of becoming choked with water, causing a stoppage of the draught, and that the man formerly in charge was dismissed by Mr. Jones because he complained of this defect?

2. Is it, or is it not, true that Mr. Jones was away in London when the accident took place; that no competent man was left in charge of the factory; and that no printed instructions exist for the guidance of the workmen in this or any other department of the Chesterfield Gas-Works?

3. Is it, or is it not, true that Mr. Oliver supplies Mr. Jones with sulphuric acid; and that he and Mr. Taylor, of Derby, are intimate friends of Mr. Jones; and that, while they were called as witnesses to prove the completeness of the apparatus, no one was present to watch the case on behalf of the deceased workmen?

4. Is it, or is it not, the general custom at these works to pour the acid into the saturator (whether by an opening in the top or at the side is immaterial) instead of using the acid tank and feed-pipe?

The Coffey still in use at Peterborough is a very different thing from that introduced 40 years ago. It was designed by the late Mr. Hathaway, Manufacturing Chemist at the Crystal Palace District Gas-Works, and is so great an improvement on previous apparatus of its kind, that the disadvantages of the latter do not exist, but the advantages are greatly increased.

I know of no disadvantage resulting from the combined Coffey still and evaporating process, except that admitted in my first letter—viz., increased expenditure of fuel. The most obvious advantages are—(1) the closed saturator, which cannot be opened during operations to introduce acid or anything else; (2) the automatic continuity of the process—the liquor is raised by a steam-pump into a tank overhead, and delivered by gravitation through the still in a continuous stream, and if the acid be pumped up, as can be done, the only manual labour consists in stoking the boiler and fishing the salt out of the evaporating pan; (3) the quality of the sulphate is far better and more uniform than by the concentrated process, inasmuch as the neutralized liquor is allowed to stand in a settling-tank before being run into the evaporating pan, whereby the impurities in suspension are deposited and separated from the liquor. I have seen samples of sulphate from some of the largest works in the kingdom, manufactured on the system that Mr. Jones employs, and they were all inferior to the salt produced by my apparatus. The fumes from the saturator pass through an acid catch-box, and then away to a condenser. From thence, after all traces of ammonia are eliminated, and returned, condensed, into the tank, the dry sulphurous gases are burnt, and pass out at the top of a high chimney. If it be required to take out the fixed ammonia, the waste liquor can be treated with lime, and passed through a second still, or the original liquor may be first treated in the same manner in a separate tank, and after the carbonated lime has been allowed to settle, the clear liquor may be passed through the still.

Mr. Jones may be a competent chemist; but, as a knowledge of chemistry is an essential part of the education of a gas engineer, Mr. Jones may reasonably suppose others also to possess it.

GEORGE ERNEST STEVENSON.

Gas-Works, Peterborough, April 24, 1880.

Legal Intelligence.

HANTS, WILTS, AND DORSET SPRING ASSIZES.

WINCHESTER, THURSDAY, APRIL 22.

(*Before Justice* HAWKINS.)

FORGERY, EMBEZZLEMENT, AND FRAUD BY A GAS-WORKS MANAGER.

William Barrett Swaine, alias *William Barratt*, 31, described as a gas engineer, was charged on four indictments with forging and uttering eight certificates of shares in the Swindon Gas and Coke Company, with intent to defraud Ann Pedder Boniface, Elizabeth Eagles, and others, in December last. He was further charged with obtaining two sums of £25 and £22 10s. with intent to defraud. The facts of the case were fully reported in the JOURNAL as recently as the 2nd ult.

Prisoner, who pleaded guilty, admitted two previous convictions for fraud, but said that although he had resolved not to go "outside" the law again, he had been led astray by another. He said he did not wish it to be thought that he was insensible of the gravity of the crime he had committed, but he considered it was due to his wife and family to state a few facts. When in prison on a former occasion he resolved that on obtaining his liberty again he would endeavour to regain the position he had lost. When he came out of prison he was without a friend in the world. He had no one but his wife and family, and for some years they laboured hard together. He filled two offices of trust in an inferior position, but he ultimately obtained the one where the present crime was committed. He had

in the meantime changed his name twice, because he was in debt previous to his conviction, and he had been much harassed by persons to whom he was justly indebted, but who wanted payment of their debts when he was not in a position to discharge them. He had not been in his last situation more than a fortnight when he was recognized by a person whom he had known in prison. He asked prisoner for employment, which he could not give him, but he did give him 10s. to pay his fare to London. He failed to go there, and threatened to expose him (prisoner) to his employers if he did not give him more money, when his wife and family would have been thrown on the world again. Foolishly he gave the man more money, and this was the first step which brought him into difficulties again. From time to time these demands were renewed, and it was in endeavouring to make the payments that he was led again into crime. He had a delicate wife and four young children, and his wife was again just about to be confined with another child, and they were at the present moment in circumstances actually wanting bread. The wife, with her four children, had only 5s. a week allowed them for their support, and one of the children was so afflicted that it required to be constantly watched. Under these circumstances he cast himself on the mercy of the Court, hoping that they would warrant his lordship in extending mercy to him.

Justice HAWKINS, commenting on the serious offence to which the prisoner had pleaded guilty, observed that persons who committed crime seldom did so without involving others in the consequences of their acts, which should be considered by them before they permitted themselves to come within the operation of the law. A judge had often to struggle between his own feelings and the demands of public justice, and if he gave way to the former, very many would escape the just punishment of their crimes. The prisoner had had printed in London false share certificates of the Swindon Gas Company, and had passed them off as genuine, to persons who could ill afford to part with their money. He hoped the sentence he was about to impose would not be thought too light—five years penal servitude.

MIDDLESEX COURT OF QUARTER SESSIONS, WESTMINSTER.

SATURDAY, APRIL 17.

EAST LONDON WATER-WORKS COMPANY, APPELLANTS, *v.* THE STAINES UNION ASSESSMENT COMMITTEE, RESPONDENTS.

This was an appeal by the Company against a revaluation made by Mr. William Marshall, of their auxiliary works in the parish of Sunbury, the result of the revaluation being an increase in the rateable value from £2720 to £5241. When the appellants appeared before the Assessment Committee in October last, they were represented by Mr. Finlay, who contended that the works were merely an auxiliary source of supply, and only required during a dry season, and then for but a few weeks. In 1878 the cost of keeping them in working order had been a great loss to the Company, as in that year they could have dispensed with them entirely. He contended that when in use they should be rated upon the same principle as brickfields, that is, according to their yield, and when not in use upon the principle laid down in the case of *Staley v. Castleton* (33 *L. J.*, M. C., 187), as a warehouse for the machinery. Mr. Marshall, who gave evidence in support of his valuation, maintained that, inasmuch as there was no annual exhaustion of the *corpus*, the brickfield case would not apply. He said that Parliament was asked in 1867 for powers to construct the works, and the Company's Engineer, Mr. C. Greaves, supported by Mr. F. J. Bateman, gave to the Committee of the House of Commons appointed to inquire into the matter, most potent reasons for their construction. If the works were necessary then during a period of drought, how much more so must they be now, when the amount of water required was nearly doubled. Mr. Marshall also submitted that the principle had been conclusively settled by the decision in the Birmingham Canal Case (19 *L. T.*, N. S., 311), where the Lord Chief Justice, in delivering judgment, said: "With regard to the engine-house, it has a certain value by reason of the land or the building erected upon it, and of the machinery attached to that building, all of which is necessary for the purpose of the canal. It is situated in Birmingham, it is only made available and put to a particular use on certain occasions, or, if you like, in certain contingencies; nevertheless, it must always be there. It has a certain value with respect to the land, and the buildings upon it and the machinery permanently affixed to it, and in that respect I think it ought to be rated, whether it is used all the year or not." The Assessment Committee thereupon declined to make any reduction, which caused the Company to give notice of appeal.

Mr. MEAD, on behalf of the appellants, now informed the Court that they had abandoned their intention of appealing.

This course was assented to by the Court, and an order for costs was made upon the Company.

SALFORD HUNDRED QUARTER SESSIONS.—MONDAY, APRIL 19.

(*Before Mr.* W. H. HIGGIN, Q.C., *Chairman.*)

APPOINTMENT OF AN AUDITOR OF THE STRETFORD GAS COMPANY'S ACCOUNTS.

An application having been made to the Court on behalf of Mr. C. A. Burghardt and Mr. A. Sussum, as representatives of the Stretford Gas Consumers Vigilance Committee, praying for the appointment by the Court of an Auditor to examine the accounts of the Stretford Gas Company, with a view to obtain, after the Auditor should have presented his report, an order for the reduction in the price of the gas charged by the Company,

Mr. S. TAYLOR, who appeared for the petitioners, said he made the application under the 35th section of the Gas-Works Clauses Act, 1847. He understood that Mr. Nash, who appeared for the Company, was prepared to consent to the order asked for. What he (Mr. Taylor) applied for was the appointment of an Accountant to go through the books of the Company. This gentleman would be agreed upon between the parties. The trouble, therefore, of fixing upon somebody to examine the books would not devolve upon the Court.

Mr. NASH said he practically consented to the application made by the Vigilance Committee.

The CHAIRMAN: What is meant by the Vigilance Committee?

Mr. NASH said that the Committee consisted of a number of gentlemen who had banded themselves together for the purpose of cheapening the supply of gas to Stretford. He (Mr. Nash) lived at Stretford, but he had always been perfectly satisfied with the price charged.

The CHAIRMAN: Mr. Nash, you had better go into the witness-box yourself.

Mr. NASH: Oh, no. The Company wish me to say that they have no desire to oppose any proper investigation of the accounts. On the contrary, they are most anxious to assist the petitioners.

The CHAIRMAN read a paragraph in the petition, from which he said he gathered that the petitioners complained that the consumers were overcharged, and that money had been paid to the Shareholders of the Company which, under the provisions of the Act of Parliament, they were not entitled to receive.

The Court granted the application, and Mr. William Aldred, of Dickinson Street, Manchester, was ultimately chosen as Auditor, his appointment being approved by the Company.

ST. HELEN'S COUNTY COURT—WEDNESDAY, APRIL 21.

(*Before Mr.* T. P. E. THOMPSON, *Judge.*)

NOTICE REQUIRED BEFORE INCREASING THE PRICE OF GAS.

In the case of the *Widnes Local Board v. Gardiner*, the plaintiffs claimed to recover the sum of £9 18s. 9d., for gas supplied under the following circumstances:—

The Widnes Local Board obtained an Act of Parliament in 1875 empowering them to extend their limits of supply, and also to charge 6s. per 1000 feet for gas. The defendant, who was in the employ of the Ditton Iron Company, was a consumer prior to that year, and originally was charged at the rate of 4s. 6d. per 1000 feet; but when the Local Board arranged to supply that Company with gas, the defendant also arranged with the Board to be supplied at 6d. per 1000 feet more than the price charged to the Company. This agreement was continued for some time, until the price was reduced in Widnes to 4s. per 1000 feet, and accordingly there was a corresponding reduction made to the defendant. However, at the commencement of the year 1878, the Board began to charge at the rate of 6s. per 1000 feet, which was continued down to the end of March, 1879, when the price was again reduced 1s. per 1000 feet. The defendant had paid at the rate of 4s. per 1000 feet down to March, 1879, and it was contended, on behalf of the plaintiffs, that the defendant having had notice that in future the Board intended to charge 6s. and then 5s. per 1000 feet, if he continued to use the gas he was bound to pay the full price, and if he did not intend to use it he should have had it cut off. It transpired, however, that on July 25, 1878, the defendant wrote to the plaintiffs, saying that as he had not had any intimation of an increase in price he should refuse to pay more than the price originally agreed upon, and telling the Board to cut his supply off. The Board, however, did not do so, and defendant's counsel contended that he (defendant) was not liable for the amount of the increase over and above the price agreed upon at first, after he had once given the Board notice to cut off his supply.

Mr. THOMPSON agreed with this view, and pronounced judgment for the defendant, with costs.

Leave of appeal was given.

The Board further sued Messrs. R. and P. Leather for £1 8s. 8d. for gas supplied.

In this case it appeared that the defendants became consumers of the Board's gas in 1876, at the rate of 4s. 6d. per 1000 feet, and continued to pay this price regularly till the end of 1877. At the commencement of 1878 the Board began to charge 6s. per 1000 feet, and when they sent in the quarterly account at the end of March, the defendants refused to pay more than at the rate of 4s. 6d. per 1000 feet, as they had not had notice of the advance.

Mr. THOMPSON held that the plaintiffs ought to have sent notice to the defendants of their intention to increase the price of the gas before it was consumed, and not afterwards. He, therefore, gave judgment for the defendants.

There were several other cases of a similar character to this one, in all of which judgment was given for the defendants.

In reference to the case which was reported in the JOURNAL of the 13th inst.—in which the North Middlesex Gas Company were summoned by Dr. Breeze for an alleged deficiency in the supply of gas to his house, while a cross-summons was taken out by the Company against Dr. Breeze for non-payment of his gas account—Mr. Johnson, the Inspector of the Company, attended at the Highgate Petty Sessions yesterday week, and said he had to ask permission of the Bench to withdraw the summons taken out by the Company, as Dr. Breeze had paid the amount which was due, and had intimated that the supply of gas at his residence was now satisfactory. There being no objection raised, the summons was accordingly withdrawn.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

METROPOLITAN BOARD OF WORKS.

At the Meeting of the Board on Friday last—Sir J. M. HOGG in the chair,

Mr. SELWAY brought forward the following motion, of which he had given notice:—"That it be referred to the Works and General Purposes Committee, to consider and report as to the advisability of this Board applying to Parliament for an Act to improve the Water Supply of the Metropolis, either by amending and regulating the powers of the existing Water Companies, by consolidating their undertakings, by providing an additional supply of pure water, or by any other means the Committee may deem desirable, with authority to confer with Her Majesty's Government thereon." In moving its adoption, he said the subject of the Metropolitan Water Supply, which was one of great importance, did not then come before the Board for the first time. They had had it under consideration on former occasions, and it probably would not now have been brought forward again but for the changes which were taking place in relation to Her Majesty's Government, which led to the supposition that the Water Bill introduced by the late Home Secretary might be considered to be defunct. Therefore the ground was again opened. So long as this Bill stood in the way, the Board could not take any action whatever in regard to the matter; but it occurred to him that, as soon as the Bill was dead, it was the duty of the Board once more to enter upon the consideration of this great question. In framing his notice of motion he intended to make it as wide as possible, and he felt assured that he had laid himself open to the charge of indefiniteness. Gentlemen might say that he had not in it expressed any preference for one course over another; and that was true. But he had drawn the notice in the way he had done, in order that the Works and General Purposes Committee, to whom he trusted the matter would be sent, should not be bound to any one scheme which he might have shadowed forth as having a preference for. It would be for that Committee to consider the various schemes which might be brought before them. There was a general feeling abroad that the Water Companies of the Metropolis might very well be subjected to further legislation and control, and legislation in this direction would not be novel. There was the Water Act of 1852, which had three very special objects in view. It provided that no water should be sent into London from below Teddington Lock; secondly, it provided that no reservoirs or aqueducts within the immediate neighbourhood of London should be left open, but were to be covered; and, thirdly, it provided that the water should be effectually filtered. Then there was the Act of 1871, which professed to be an Act for securing a constant supply of pure and wholesome water; but in reading through that Act he failed to see where the pure and wholesome water was to come from. The supply with which London was furnished was at present largely intermittent, and in many instances was small in quantity. He thought, taking the broad average, that the water supplied to the Metropolis was probably sufficient; but in many instances this was not so. From some cause or other, in the poorer districts of London it was a very common thing indeed

for houses to be many hours and even days unsupplied with water. It might not always be the fault of the Water Companies—he did not charge them with this; but merely stated the fact. Then the rates were not uniform, and in many instances they became, as he thought, unjust and oppressive. The powers which the Water Companies had to fix rates upon dwelling-houses varied. For a house valued at £30 rent, the rate of one Company was as low as £1 8s. per annum, while another Company's rate was as high as £2 12s. per annum. For a house of the value of £50 per annum, one Company's rate was as low as £2 6s., and the other Companies went gradually up until they reached £3 17s. A house of £100 value was rated by one Company at £4, and the others went up gradually to £6. For houses of £200 value the lowest rate was £6 10s., and the other rates went up gradually to £11. Those charges included one closet in each case; and he found the very singular fact, that in one house of a certain value a closet would be charged at 4s. per annum, while a closet in the larger houses was charged 20s. per annum. He apprehended that the quantity of water used in a water-closet was the same in one house as in another, and he failed to see why such heavy charges should be made. There were singular charges by some of the Companies; for instance, they charged linendrapers a heavier rate for supplying their shops than they charged some other shopkeepers. Why this was done he failed to see. He could understand why beershops should be charged heavier for their water supply, as they might draw largely from it; also cowkeepers, because milk might be diluted. As the water-rate was charged upon the value of the house, there was this singular anomaly, that as the rating value of the house went up from time to time, and the assessment rose, so the Water Companies made advances, without giving any additional supply of water whatever, either to a house or to a shop; and no allowance was made on account of the increased value of premises owing to their being devoted to trade purposes. A shop was charged at its value, and not in regard to the water supplied to it; therefore the charges pressed very heavily indeed upon shopkeepers and owners of any large premises. One very essential point in the future regulation of the water supply of the Metropolis must necessarily be that the water supply to every house should be registered by meter. At present the cost of a water-meter was very large, and it was thought that it would not pay to have a meter fixed in every house; but no doubt a cheap and effective meter would be devised if this system were to be adopted. A second most important thing was a better supply of water for extinguishing fires. Captain Shaw told a Committee of the House of Commons that his requirement—which he called a moderate requirement—was 2000 gallons of water per minute, to be supplied to 14 engines, which would be at a very large fire. That was less than 150 gallons per minute to each engine, and was equal to 3 million gallons in the 24 hours; but it was only 1-40th of the total daily supply to the Metropolis. Happily, great fires did not take place every day, nor were they continuous. Captain Shaw required, on an average, 1-40th part of the total supply, and yet all the Engineers of the large Water Companies said this was a quantity which they were utterly unable to supply. Before the same Committee the Engineer of the New River Company spoke of this as being an extraordinarily large supply, and the Engineer of the East London Water Company said it was a quantity of water which no Water Company could supply at any one spot at one time. It was evident, from what the Water Companies engineers themselves said, that it was an awkward requirement of Captain Shaw, that even only 1-40th of the total supply of a day should be consecrated once and again to extinguishing a large fire. That was not the worst point. It was not only that the Water Companies could not supply the quantity, but they could not supply it at an adequate pressure. The Engineer of the East London Water Company said that they could not supply it even from the surface, much less with a pressure so as to make it effective. He (Mr. Selway) supposed the members knew what often happened in a case of fire. A fire broke out a few Sundays ago in his neighbourhood. An acquaintance of his, a member of the Vestry, who happened to be passing, told him it was 14 or 15 minutes before there was any supply of water, and when it did come it only rose about 2 feet from the ground, and was utterly inadequate for fire purposes. The Board would not be surprised to hear that the whole place was entirely destroyed, though Captain Shaw had a number of fire-engines and men upon the spot. Therefore they wanted the Water Companies to be regulated for those purposes amongst many others. Something should also be said upon the quality of the water which was supplied. There were about 120 million gallons, on an average, brought into the Metropolis every day, and of that quantity the Thames and Lea together supplied about 100 million gallons, the remainder being derived from deep wells. The waters from these two rivers were filtered and sent into the Metropolis, but it was a question whether the filtering effectually removed all impurities, and Major Bolton, in his last report, spoke of the turbidity and colour of the water. He (Mr. Selway) was aware that in large districts of the Metropolis excellent water was supplied; but in the south of London, very bad water relatively was delivered to the consumers. He would like to see a uniform charge all over the Metropolis, and, so far as could be, a uniform quality. He failed to see why the poorer inhabitants should be supplied with an inferior article. It was known that an abundant supply of better water could be obtained from the deep wells in the chalk strata, and from some of the valleys lying round London; and there would be no difficulty in bringing a large quantity of pure water into the Metropolis. It was a question whether those advantages could be obtained by regulation only, or whether they would not be better obtained by consolidation. One management would give uniformity of rating, and probably of quality, and economy would certainly be the result. If the Water Companies were consolidated, why should not the Board be the authority for controlling and regulating the water supply. In the Act of 1871 they were named as the Local Authority, and he failed to see why they should give up being the Central Authority for London, and differ from other Municipal Authorities over the whole kingdom. Dublin, Liverpool, Manchester, Birmingham, and other great cities and towns, managed their own water supply, and London was the exception. It might be said that the Board were not large enough or wise enough for such a purpose. If not, let them have a larger and a more clever Board; but, at any rate, the Metropolitan Board of Works, however constituted, should be the authority for managing the water supply. If a second supply were brought into the Metropolis, vested interests must be respected. They always respected vested interests very strongly in this country; but he had yet to learn that the existing Water Companies had a monopoly. There was no reason why an additional supply should not be brought into the Metropolis, as the concerns were simply trading Companies. If Parliament had allowed eight Companies to come into the Metropolis for the purpose of supplying water, why should they not allow another body to form the ninth? The Act 18 & 19 Vict., cap. 120, authorized Vestries and District Boards to sink wells, purchase or rent streams, or do anything to bring water into their respective localities, for the purposes of street-watering or for gratuitous distribution to the ratepayers. Why could not the whole of the Vestries combine through their representatives on the Metropolitan Board? Let every Vestry supply water gratuitously to the inhabitants, and for street-watering purposes and fire purposes; and let the water now supplied, which was admitted in many instances to be not of the purity it might be, remain for more cleansing purposes. If the Companies were not moderate in their demands, a new service must be pressed for, and one day a new service must come. He would say nothing about the scheme which the Board had in contemplation some time ago—a scheme which had very many strong points for its recommendation; but they must have a better supply of purer water, supplied at adequate pressure, and the charges should be regulated and controlled. He had no preference for either of the schemes he had mentioned in his resolution, but he asked that the Board would send it to the Works and General Purposes Committee, where it would obtain that careful consideration which every important matter received at the hands of that Committee, and the result, after conference with Her Majesty's Government, would be the production of some scheme or other which he hoped and believed would be for the benefit of the ratepayers of the Metropolis.

Mr. Cook, in seconding the motion, said that perhaps the most important question of local government was as to the supply of pure water. It was one of the primary necessaries of life, and certainly the water supplied to the Metropolis could not be said to be pure or abundant enough, and it was not supplied at sufficiently high pressure. The charge made for water upon those who had to drink it was out of all proportion to the supply given to people. The scheme before Parliament in the early part of this year was notoriously an improper one. If there were no other evidence, the rising of the price of shares on the Exchange was sufficient to condemn the scheme. The difference between the value of the Water Companies, as expressed by the valuation of their shares on the Stock Exchange before the promulgation of the terms of the purchase, and after those terms became known to the public, would have been more than sufficient to have given the Metropolis the scheme for a constant supply of pure water at a high pressure, which the Board wanted to bring into Parliament two years ago. The difference in the value of the shares, if capitalized, would have been something over ten millions. Sir Joseph Bazalgette estimated that a constant supply of water at high pressure all over London would cost about ten millions. Under Mr. Cross's Bill, had it become law, the public would have been in the position of paying a price to the Water Companies so much above the value, that the difference would have given a fresh supply of pure water for the Metropolis. It was evident from this fact that the Bill never could be carried into law, and under the circumstances it seemed most probable that the Government would bring in a new scheme. There was no other body in the Metropolis capable of managing the water except the Metropolitan Board, and unless they neglected their duty, they were bound, in the interests of those they represented, to endeavour to do something towards supplying that great deficiency, and to do it as soon as ever they could.

Mr. Jones said the Board stood in an awkward position as to this question. They had been assured by Parliament that when they attempted to regulate the Water Supply of the Metropolis, they were doing something for which they had no power. Therefore all they could do, in such a case, was to make abstract propositions, and no more could be done when the motion went to the Works Committee. Not one shilling could be expended in reference to any suggestions, because the House of Commons had declared that the public benefit of the Metropolis was not involved in the supply of water to it; but every one else would have believed they had the right to manage the water supply. The House of Commons distinctly declared, in the Indemnity Act obtained last year, that the Board were going beyond their power in taking any cognizance of the water supply. Discontent in relation to the water question was no new thing. When authority was given for a 4 per cent. charge to be made upon the assessments as the recompense of the Water Companies, the assessment of London was about half what it was now. Mr. Selway had pointed out that there was no connection between the improved assessment of London and the additional rate which the Water Companies were enabled to charge. The assessment on the valuation of houses was not selected by the Companies themselves. It was forced upon them for the purpose of limiting the charges they were to make. When it was settled that they should only charge 4 per cent., it was never contemplated that they would at each new valuation increase their charge. There was also discontent as to the quality of the water, and the obligations of the 4 per cent. on the assessment were that the Companies should provide pure water with constant pressure, which he understood they did not do. Dr. Frankland declared that in the year 1878, 60 million gallons of water were polluted with sewage matter; 52 million gallons were occasionally so polluted; and 7 million gallons were of unexceptionable quality. To rescue themselves from this position, two courses were open—they could either make the Companies their agents, under new conditions; or, by a totally fresh supply, leave the Companies to do the best they could.

Mr. Turner moved the adjournment of the debate until next Friday, as the matter ought not to be hurriedly decided upon.

Mr. Fowler seconded the motion for an adjournment.

Mr. Runtz did not see the necessity for an adjournment, as it appeared to him that the Board were powerless in the matter. All they could do would be to go to Her Majesty's Government, and ask them to take up the question. Up to the time of the passing of the Indemnity Act last year, he believed the Board were within their powers in doing what they had done to get a supply of pure water for London. But that Act declared that they went beyond their powers, and after this declaration they could not spend sixpence on the question. In the early part of 1870, the Commission of which the Duke of Richmond was the Chairman said it was desirable that the supply of water to the Metropolis should be in the hands of a public authority rather than in the hands of commercial companies. He thought the Board had already enough work to do, without having the management of the water supply. If the Board had that management it would come to this, that the water supply would be managed by officers appointed by them, and they would remain partially ignorant of what was taking place. He thought an adjournment would be no good; but if the question were referred to the Works and General Purposes Committee for them to confer with the Government with a view to immediate steps being taken to improve the water supply of the Metropolis, he would vote for it.

Mr. Richardson thought the discussion should not be adjourned, but he disagreed with the remark as to the Board not being able to deal with the matter because they had so much work on hand. He suggested that the question should be referred to the Works and General Purposes Committee to consider as to the advisability of the Board taking further action with respect to the improving of the Water Supply of the Metropolis. They need not bind themselves to go to Parliament at all. He thought the Directors and Shareholders of Water Companies were in such a turmoil, in consequence of the feelings which the Water Bill called into play, that they would be ready to give up certain matters for which they had made claims.

The debate was then adjourned till Friday next—17 members voting for the adjournment, and 7 against it.

Lieut.-Col. Bolton's report on the examination made of the water supplied by the Metropolitan Water Companies during last month, says

that the state of the water in the Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was good from the 1st to the 3rd, when it became very bad, and remained in a bad condition until the 13th; it then improved in quality, and continued in a good state for the remainder of the month. The highest flood state of the river at West Molesey during the month was 3 feet above summer level, and the lowest 6 inches above the summer level, the rainfall being 0·31 inch. The water in the River Lea was generally good during the month. [These remarks refer to the condition of the water previous to filtration.] The water at all the intakes was in a better condition during the month of March than in February. The filtration was efficient, the water supplied by all the Metropolitan Water Companies having been clear, bright, and properly filtered.

GLASGOW CORPORATION WATER SUPPLY.

At the Meeting of the Glasgow Water Commissioners on the 15th inst., the Sub-Committee on Finance submitted the following estimate of the revenue and expenditure for the year from May 28, 1880, to May 28, 1881:—

Glasgow Corporation Water-Works.

Expenditure—		£117,724
Deficiency in river supply revenue account		5,273
Sinking-fund		22,950
Surplus		1,177
Total		£147,124
Revenue—		
Domestic water-rate, in	£38,662	
Less abatements	2,838	
	£35,824	
Domestic water-rate out	£27,889	
Less abatements	1,354	
	26,535	
	£62,359	
Public water-rate	11,962	
Trade charges	23,844	
Supplies by meter	40,305	
Builders, arrears, costs, ground annuals, &c	1,820	
	£140,290	
Testing and stamping account	100	
		£140,390
Balance from revenue account, year 1879–80		6,734
		£147,124

River Supply Works.

Expenditure	£6,238
Sinking-fund	1,575
	£7,813
Revenue	2,540
Balance carried to debit of Glasgow Corporation Water-Works revenue account	£5,273

The Sub-Committee also agreed to recommend the Water Committee to report to the Commissioners that they are of opinion—(1) that the sum to be set apart as a sinking-fund for the said year 1880-81 should be £24,525 (that is £22,950 for the "Glasgow water account," and £1575 for the "river supply account"), being at the rate of 1¼ per cent. on the amount of money borrowed; (2) (*a*) that the amount of the domestic water-rate to be assessed and levied within the limits of compulsory supply for the said year 1880-81 should be continued at 8d. in the pound, (*b*) that the amount of the domestic water-rate to be levied for the same period upon and from the occupiers of all dwelling houses, and of such parts and portions of all shops and buildings as may be used as dwelling-houses beyond the limits of compulsory supply, but included within the limits of the Glasgow Corporation Water-Works Act, 1855, should be continued at 11d. in the pound, and (*c*) that the public water-rate should be continued at 1d. in the pound; and (3) that no alteration be made on the present table of rates and charges for supplies of water (excluding river supply water) for other than domestic purposes.

The Treasurer reported that the revenue collected as at March 29 was—

1878-79	£118,667	6	1
1879-80	119,944	10	6½
Increase	£1,277	4	5½

BEVERLEY CORPORATION GAS SUPPLY.—Mr. J. S. Davy, one of the Local Government Board Inspectors, held an inquiry, on the 15th inst., into an application from the Corporation of Beverley, as the Urban Sanitary Authority, for a Provisional Order under the Public Health Act, to partially repeal, alter, or amend their local Act, so as to provide that the sums borrowed on the gas-works, under their Act, may be re-borrowed, and the Corporation enabled to establish a sinking-fund for the liquidation of the sums so re-borrowed. It was explained to the Inspector that only a comparatively small sum is required to be borrowed—viz., £9000 or £10,000—which would extinguish the whole of the debt on the gas-works, the latter being valued at £35,000 or £40,000. The time asked for repayment was 60 years, so that the present generation should not be saddled with the whole of the cost.

ROTHERHAM CORPORATION WATER SUPPLY.—On Friday, the 16th inst., one of the Local Government Board's Inspectors held an inquiry at Rotherham, on the application of the Corporation to the Central Board for a Provisional Order to alter and amend certain of their local Acts, with respect to the borrowing powers and the repayment of sums borrowed or to be borrowed. The Town Clerk (Mr. G. W. Hodgkinson) stated that the actual intention of the application was to relieve the rates of the borough, and if the Council were successful in procuring the Order in the terms in which it was applied for, there would be a saving to the ratepayers of about £1500 per annum. The financial bearings of the application were fully explained to the Inspector. It was pointed out that there were special circumstances connected with the Corporation's finances which rendered it very necessary that the application should be granted. The town, it was stated, had been forced into the acquisition of a water supply over and above its actual present requirements, owing to the action of the Doncaster Corporation, who tried to include the Rotherham watershed in their late scheme of water supply. The area of the borough also was very large, and mains had had to be extended into thinly-populated parts of the district. There was at present, therefore, no adequate return for the revenue expended, and last year alone a deficit of £1895 on the water-works account was shown. The Inspector promised to recommend the case to the Local Government Board as favourably as possible.

IMPROVEMENTS IN GAS-STOVES.

At a recent meeting of the Philosophical Society of Glasgow, Dr. JAMES ADAMS read a paper on "Improvements in Gas-Stoves," which was illustrated by a heating-stove of his own invention in operation. He commenced by saying that twenty-five years ago he had read to the Glasgow Medical Society a paper on "Heating by Gas," when he also exhibited a stove made to his own design. It was his belief that the stove in question surpassed anything of the same kind since open to public observation; but it was liable to drawbacks which he then failed to overcome, and, therefore, he put aside his conception. Nevertheless, he retained his desire to see it realized, being sensible that he had made a substantial step in advance, and he had kept himself informed of, and had noted with interest all that had since been done in this connection. About 18 months ago he entered with zest upon a practical investigation, feeling assured that the principles were sound that he had assumed for his guidance, and had practically embodied in his infant conception. After describing the complex character of coal gas in respect of its composition, he went on to say that when coal gas was burned its constituents were transformed into other gases and vapours, and that on this point there was much popular ignorance, as it was assumed that because no smoke and no marked odour might be perceptible, combustion had left behind it nothing injurious. There was a hazy conception that perfect combustion meant something like practical annihilation; but, in point of fact, the invisible, mal-odorous, inflammable gas had been merely transformed into invisible, non-odorous, non-inflammable gas. The carbon had united with the oxygen of the atmosphere, and formed carbonic acid—a deadly poison if inhaled pure; and the hydrogen had also united with the oxygen of the air and formed watery vapour, whilst a large quantity of nitrogen had been set free from the air. But if the combustion had not been perfect, there was formed, in addition to carbonic acid, another still more poisonous gas, called carbonic oxide; and the common-sense deduction from these facts was that gas-stoves should be provided with flues to carry off the waste products of combustion into a chimney. It should scarcely be necessary to add that where a stove was substituted for a grate, as a means of heating an apartment, there should be retained the open chimney, or other means of proper ventilation which the open fireplace usually ensured.

The amount of light obtained by the combustion of coal gas varied according to the construction of the burner employed. The same gas which gave a poor, yellow, smoky flame when burned with a "rat-tail," was brilliantly white when a union jet was used, still brighter with a common Argand, better still with a Sugg's Argand, while in the latest street-lamps introduced in Paris, of which several were under observation in Glasgow, a perfection seemed to have been reached that rivalled the electric light. The production of heat, which, as a force, was identical with light, was quite as much influenced by the form of the burner employed; and as the phenomena of light required to be considered with reference to the luminous rays, chemical rays, coloured rays, &c., so did the phenomena of heat require to be considered with reference to dark rays, visible rays, and other components or characteristics. Thus, the several properties through which heat was communicated—namely, conduction, convection, and radiation—had each their special value and appropriate use, and ought to be carefully studied so as best to ensure the maximum intensity of each property, as well separately as in combinations. A kettle over the fire was boiled partly by convected heat contained in the diffuse mass of flame and smoke ascending the chimney, and partly by radiant heat emitted by the solid incandescent coal underneath; but a leg of mutton placed in front of the same fire received no heat whatever from convection, but was roasted exclusively by radiant heat emitted chiefly from the red-hot coal, only a very small proportion of radiant heat being emitted by the flame and smoke. By accurate observers it had been determined that about three-fourths of the heat from an open fire was convected heat, nearly all of which passed up the chimney, leaving only a fourth to be utilized as radiant heat. When coal gas was used as fuel, and the ordinary jets for lighting purposes were employed, the convected heat which was generated amounted to 84 per cent., or five-sixths of the whole, and only 16 per cent., or about one-sixth, was given out as radiant heat. When the Bunsen burner in any of its forms was employed, the heat generated was almost entirely that of convection, about 6 per cent. only consisting of radiant heat. The difference in the proportion of radiant and of convected heat emitted by the same gas by a mere change in the method of combustion depended on the presence of solid carbonaceous particles in the luminous flame. This question had been worked out by Professor Tyndall, and the results were recorded in his "Contributions to Molecular Physics in the Domain of Radiant Heat." Using an apparatus of sensitive precision, he found the radiation from the luminous gas-flame was fully two and a half times that from the non-luminous flame. The degree of force—not the degrees of temperature—in the luminous flame was 30, and the radiation fell to a force of only 12 the instant the flame became non-luminous. But by introducing solid matter the radiation originating in the non-luminous flame became so intense that a spiral of platinum plunged in the former brought up the index to a force equal to 200. In other words, there was instantly generated an amount of radiant heat more than six times that obtained from the luminous gas-flame, and more than thirty times that of the non-luminous flame. "It is mainly," says Tyndall, "by convection that the hydrogen flame disperses its heat; though its temperature is higher, its sparsely scattered molecules are not able to cope in radiant energy with the solid carbon of the luminous flame. The same is true for the flame of a Bunsen burner. The moment the air (which destroys the solid carbon particles) mingles with the gas-flame, the radiation falls considerably. Conversely, a gush of radiant heat accompanies the shutting out of the air, which deprives the gas-flame of its luminosity. When, therefore, we introduce a platinum wire into a hydrogen flame, or carbon particles [or platinum or various other solids] into a Bunsen flame, we obtain not only waves of a new period, *but also convert a large portion of the heat of convection into the heat of radiation.*"

To obtain in a practical form the means of converting the heat of convection into the heat of radiation was the chief aim of the author's efforts for the improvement of gas-stoves, and the following is a short description of the method by which he accomplishes his object. He employs in gas heating-stoves a burner consisting of a group of hollow perforated tubes of fire-clay, supplied internally with a mixture of gas and air, which, passing through the perforations, burns on the outer surface. These fire-clay tubes, called "atmopyres," are enclosed in a case or chamber which prevents free access of air to their exteriors, where combustion is completed; but by means of perforations a small quantity of air is admitted, which ascends within and between the tubes, and ensures complete combustion, so as to cause the fire-clay tubes to become brightly incandescent. Thus only the smallest practicable excess of unconsumed air is permitted to mix with the products of combustion. These products are led to a chimney by means of a flue of peculiar construction, and in this flue they are detained until they have parted with all their available heat. Other channels or ducts lead currents of pure air along the heated walls of the flue channel, and the air so warmed is allowed to re-enter the room in which the stove is used. The walls of the air channels or ducts, and

generally the casings of the stove, present an extensive surface (obtained by duplications of the casings) to take up the heat from the products of combustion traversing the flue channel, and consequently these surfaces do not become overheated. The air entering the stove is caused to pass into it at or near the top, and thus a supply free from dust is ensured, and draughts along the floor of the room are avoided. The warm air issuing from the stove is caused to pass over water contained in a trough so formed that by filling it more or less, the surface of water exposed to the warm air may be varied. Lastly, not to dwell on too many points, provision is made by which the risk of explosion is entirely obviated. Dr. Adams stated that the limited time at his disposal would not admit of a detailed account being given of the arrangements by which the exact consumption of gas necessary to produce the full efficiency of the stove was regulated with automatic precision, and by which the quantity of air necessary for perfect combustion was also supplied efficiently and automatically. On the last head, however, he remarked that air was admitted to the combustion chamber by small apertures of carefully-regulated size and fixed number, corresponding to the designed supply of gas; that the air was projected in fine jets; and that it was so diffused that all, or nearly all was brought into actual contact with the gas fuel, and in the right proportion.

Knowing that an enormous amount of the heat produced by gas combustion, whatever the method employed, consisted of, or rather was lodged in the molecules of the gases or vapours forming the waste products, Dr. Adams deprecated the common practice of letting them go at large into the atmosphere, or sending them by the shortest cut up the chimney. But as a portion of the waste products consisted of water in the condition of vapour, which, at a temperature under 212° Fahr., would condense and trickle down as water; and as another portion consisted of carbonic acid, which, at the same temperature, was more than half again heavier than air, and would not ascend the chimney unless in a heated and expanded condition, there was a necessity that he should let some of the heat go. As the result of numerous practical experiments, he had determined that the waste products should be passed into the chimney at a temperature not under 212° Fahr. and not above 250° Fahr., and nearer the latter than the former temperature. The average temperature under his arrangements exceeded 240° Fahr. But the waste products had an initial temperature exceeding 2000° Fahr.; and, in order to extract from them all the heat that was desirable, he caused them to traverse a flue of peculiar construction—a flue *sui generis*, being of great length, consisting of superimposed horizontal chambers, communicating with each other by means of contracted openings, and the walls of the flue being fitted with baffle plates. Each of these peculiarities had a separate action, and exerted a marked influence, and the combined result was to cause the waste products to travel slowly, at a mean temperature, and to force the gaseous molecules into individual contact with the walls of the flue, which was absolutely necessary before they could impart their contained heat.

The heat transmitted by conduction through the flue walls to the outer surfaces of the flue was also diffused by conduction over a large surface area of duplicate casings. The pure air led over that great surface was warmed to the temperature obtained under the most approved systems of warming by hot water or steam pipes, although, when desired, the heat may be greatly increased. Thus, a stove of ordinary construction had, it might be assumed, an external heating surface of 16 square feet. A stove of the same size externally, but made to the author's design, had, in addition to the external surface, an internal surface of 26 feet, making a total of 42 square feet, which was a surface equal to 42 lineal feet of a 4-inch hot steam-pipe.

One of the serious drawbacks which caused Dr. Adams to lay aside his conception of a gas-stove many years ago, and which he failed to overcome at the time, was the danger of accidents by explosions. Such accidents occasionally took place with ordinary stoves, on the incautious application of a light some little time after the gas had been turned on, or had otherwise been escaping and forming an explosive mixture of gas and air within the stove; but the construction of the Adams heating-stove was such as to make an accident from that cause an impossibility. The entire "motor force" of the stove, consisting of the furnace chamber with all the subsidiary fittings for the admission and regulation of air, &c., was attached to a closely-fitting drawer or tray, in the base of the stove, capable of sliding out and in. When the tray was withdrawn, as would always be unavoidable for lighting purposes, air was at the same time freely admitted and the stove was instantly ventilated, and any mixture of gas and air accidentally present within the stove was deprived of its explosive properties. Although a considerable interval might have elapsed between the turning on of the gas and the application of a light, no explosion could occur. These arrangements ensured—(1) that the stove was efficiently ventilated and free from an explosive accumulation of gas and air before a light could possibly be applied; (2) that the gas could only be ignited in the unconfined air of the apartment, openly, and therefore safely; and (3) that the entire "motor," with its subsidiary mechanical arrangements and connections, was freely exposed to observation on every occasion the stove was used, and thus any defective condition of the gas-fittings or other working parts could be instantly recognized and, if need be, remedied.

Several modifications of the construction of this hot-air stove had been designed by the learned author of the paper; and the one which was exhibited was a plain working model. It was for the manufacturers to employ artistic devices for the outward forms, and to construct smaller or larger sizes to meet popular requirements. As the "motor force" was of the exceptional power of which he intended to give evidence, it was capable of being applied to a variety of uses for which high temperatures were required, such as cooking-stoves, laundry and tailors stoves, conservatories, bakers ovens, and, in short, nearly all the purposes to which coal itself was usually applied.

Dr. Adams remarked that it had been pressed upon him to discuss the important question of cooking, and to give some description of the modifications of stoves which he had designed in this connection; but this was a matter that must be reserved for special and for fuller consideration than could then be given. Hitherto he had been treating of the best method of *generating* heat *within* a stove by the combustion of coal gas, and of the best method of *distributing* that heat *outside* the stove. For cooking and analogous uses the principles of construction differed entirely. The objects he had aimed at in cooking-stoves were—(1) to prevent the loss of heat outside the stove; (2) to ensure a more effective use of convected heat than hitherto; (3) to utilize the properties of pure radiant heat in a degree to which no previously existing gas-stove could make pretensions; and (4) to devise cooking utensils specially for the gas-stoves, or at least more suitable than any in ordinary use. That there was scope for improvements might be inferred from one illustration having reference to the conditions under which cooking operations were generally performed, and which would show that there was more matter for consideration in the subject than was dreamt of in the philosophy of stove manufacturers in general. At the gas apparatus exhibition in Greenock, he remarked, Mr. Stewart, M.P., while heartily desirous of aiding the movement, stated that "from what he had experienced of food cooked by gas, there was always a something left behind which one would rather have been without." Some light might be thrown upon the cause of that peculiar undesirable "something" if the arrangements made by the best stove-makers were examined. In roasting meat, the burners were placed at the bottom of the oven, and the joint was suspended above; and then, in the words of the usual advertisement, the meat "is completely enveloped in an atmosphere of heated air," the joints when "cooked have very much the same appearance as those done before an open fire, but they lose rather less in weight, are plump, and full of gravy," &c.; and, finally, it was stated that "in the roasting of a 6-lb. joint there is burned 30 cubic feet of gas." But, the author asked, was the meat roasted? Was it not rather what might be called "gassed"? It was not an atmosphere of heated air that enveloped the meat, but an atmosphere of hot waste gases, watery vapour, tar, and other impurities, the products of gas combustion. Might not the watery vapour alone have a share in producing that peculiar "something"? The combustion of 30 cubic feet of gas of average composition generated 2 lbs. avoirdupois of pure water in the shape of water vapour, and it was therefore easy to understand why the meat did not lose so much weight in the "gassing" process. It was already surrounded by a watery atmosphere, which lessened evaporation. If the meat had been roasted before a clear fire, and a pan holding 2 lbs. of water had been boiled and evaporated into steam underneath the joint, the two processes would have been perfectly analogous, with the exception that in the "gassing" process there was mixed with the watery vapour some 200 or 300 cubic feet of the waste products of gas combustion. Such facts were worthy of being pondered over, and so the author would leave them.

He then proceeded to give some evidence of the efficiency of his hot-air stove. If, he said, he simply confined himself to a bald statement that so many units of heat were utilized in the combustion of so much gas, many persons would be but little the wiser. To appraise the statement, it was necessary to know the alleged value of the units, and to have some standard or data for comparison. An English unit of heat was that amount of heat which would raise the temperature of 1 lb. of water 1° at 32° Fahr. But that standard was not conveniently applicable to the purpose of determining the calorific force of a gas-stove. There was required a different formula, and in each case intricate calculations were necessary according as the air was delivered warm, say, above 212° Fahr., or below that temperature. The specific heat of air, its weight per lb. at every degree of temperature, the elastic force of the moisture it contained, and so on, formed so many factors, making it necessary that tables and formulæ of an extensive and complicated character should be at one's elbow, and that a competent head should direct the calculations. The author's chemical friends were satisfied that the unit which he adopted, although wanting in strict scientific accuracy, was, nevertheless, perfectly fair in determining approximate values, and for purposes of comparison. He ascertained, by the use of an ordinary thermometer, the temperature of the warm air delivered, and he ascertained, by the use of a delicate anemometer, the quantity of air that entered the stove to be warmed; then he multiplied the one by the other, and called the product "units of heat." Thus, 1000 cubic feet of air might be assumed to enter the stove at a temperature of 40° Fahr., and leave it at 240° Fahr. Then, deducting the initial temperature—40° Fahr.—be multiplied the two factors:—1000 × 200 = 200,000. If the amount of gas burned was, say, 10 cubic feet, he would divide the product by 10, which gave a quotient of 20,000, and he said that 1 cubic foot of gas had yielded 20,000 units of heat. The method was simple, and easy to be practised by persons of ordinary intelligence. Its defect was chiefly with temperatures under 212° Fahr., for then much heat was rendered latent, and practically lost in converting the aqueous vapour into steam, and the rate of expansion of moist air—and air was always moist—under 212° Fahr. was enormously greater than in the case of dry air. But it was of greater importance to determine how far the units of heat produced the desired result. It was the manner in which the force was localized that gave the true measure of force in its relation to the subject under consideration, and the author therefore placed little value in a parade of units of heat, unless associated with a statement of the effects produced in the desired direction. He then went on to show that, in any point of view, whether in the number of heat units generated, or in the production of the heating result desired, there was obtained in his hot-air stove a development of motor force in gas-stoves not hitherto appreciated. That was best done, he said, by comparison. He selected the best hot-air stove which he had tested, or that had been publicly tested, so far as he knew. That to which he referred had had much attention directed to it a few months ago, as it was tested, at the instance of the manufacturer, by Mr. Joshua Horton, of Glasgow, a gentleman who was well known to have made gas matters a specialty. The result of his tests caused Mr. Horton to abandon in despair a gas-stove which he had himself contrived, and to express to Dr. Adams his opinion that he also should give up. That stove was also tested by Mr. J. L. Bruce, architect, of Glasgow, whose special knowledge of all things pertaining to the subject was well known. That gentleman had certified that, with the exception of one of the author's early rough working-models, he had not seen a gas-stove at all equal to that which was referred to. The certification and tests of those gentlemen—excluding reference to the Adams stove, which was not then open to public inspection—had been made public by the manufacturer as testimonials of merit, and the author's reference to such public facts was, therefore, legitimate. He had afterwards, in conjunction with Mr. Bruce and Mr. Harvie (a gentleman of large experience as a maker of stoves), also tested that stove. The tests were frequently repeated, and the experimenters were all practically agreed as to the results. Mr. Bruce only differed in his mode of expressing them. He preferred the use of elaborate and complicated formulæ, difficult of application, but admittedly more scientific, and yet open to fallacies from their liability to be applied under conditions for which they were not suitable. But substantially, the conclusions arrived at in the experiments were in accord. Selecting the chief items from an elaborate series of results, the author presented them in the form of a table which would be easily understood by the members:—

——	Square Feet of Heating Surface.	Units of Heat utilized per Cubic Foot of Gas.	Temperature of Air warmed above Initial Heat.	Cubic Feet of Air warmed per Cubic Foot of Gas.	Temperature of Waste Products.
No. 1 stove, presumably best in market, burning 10¼ cubic feet of gas per hour . . .	15	3,658	62° Fahr.	59	170° Fahr.
Ditto, burning 13½ cubic feet .	15	6,336	152° ,,	49	200° ,,
No. 2 stove, Dr Adams's new model, burning 12½ cubic feet of gas per hour . . .	42	51,300	190° ,,	295	244° ,,

Proceeding to refer to the table, Dr. Adams said that the units of heat utilized by radiation and contact of air from the external surfaces of the two stoves were not calculated; but as No. 2 had 3 feet of additional external surface, and a much higher temperature, any mode of calculation would show a very large addition due to that stove. Similar tests made with

cooking-stoves constructed to his design, and contrasted with others, showed a similar ratio of results. It would be asked, he said, how he accounted for the vast difference shown in the table. He replied that the explanation should suggest itself to the members when he reminded them of two conditions of which he had already treated—first, the mode in which the heat when generated was distributed; and secondly, the quality or character of the heat. They would recollect that a Bunsen flame was composed of a current of gaseous molecules, which would only give up their heat to a stove if the walls were made big enough, or the flues long enough. That principle had not been sufficiently understood, and the rule had been to let the current of molecules escape into the atmosphere or up the chimney as speedily as possible. The heat contained in those molecules was further wasted, or destroyed for practical use, by being mixed up with, and diluted through the admission of an unnecessary quantity of cold air. With those defects removed, he had transferred the same form of burner employed in No. 1 stove to No. 2 stove, when there was effected instant and great improvement. The heat utilized was 21,000 units per cubic foot of gas, and 183 cubic feet of pure air were heated to 115° Fahr. above the initial temperature for every cubic foot of gas. That great difference and excess over No. 1 stove were fairly attributable, therefore, to the altered construction of the stove, irrespective of the burner, because in both cases the same burner was employed. But the Bunsen burner had defects in its application to a hot-air stove which he had been unable to overcome. It was liable to "strike back," run down, and burn with a smoky flame, &c. Further, it was liable to be suddenly extinguished by "blow-downs" in the chimney, or by sudden strong currents caused by the opening or slamming-to of a door, &c. He had, therefore, satisfied himself that for a hot-air stove the Bunsen burner was not generally suitable. The same stove when fitted with the new combination chamber showed an enormous increase of heating force over the Bunsen; and here again he would remind the members that the character or quality of the heat generated in the new combination chamber differed very greatly in the proportions of convected and radiant heat from those generated by a Bunsen burner. Instead of a trifling percentage of radiant heat, there was produced a substantially large proportion of the most intense energy. The fire-clay burners became white hot, and the walls of the combustion chamber became red hot. That heat was not, and could not be carried off, in currents, but was instantly distributed in straight lines. Instead of being diffused through a loose cloudy current of vapour, it was concentrated and localized in a solid compact reservoir kept fully supplied, and from which the radiant heat was drawn off through the absorbing walls of the furnace chamber, from which it was communicated to the walls of the pure air chamber, which were continually being bathed by large streams of fresh air receiving heat through actual contact; and the air thus warmed was rapidly delivered by the wide vomitories of the stove. He would only further contrast the Bunsen with the "atmopyre" burner, by pointing out that the former—like an ordinary gas-jet—was a mere mechanical outlet for delivering the fuel. It was in no sense a source of heat in itself, and was only effective in the production of convected heat; but the "atmopyre" in itself became a source of heat, and was effective in the production of radiant as well as of convected heat. The new combination burner did not "strike back," and could not be extinguished except by shutting off the gas; and even then, so intense was the heat, that for several minutes after the gas was shut off, it would re-ignite when turned on.

In conclusion, Dr. Adams desired to say that it was only the chemist friends who had, at different stages of his investigation, aided him with their corroborative counsels, who could adequately appreciate the laborious details involved in giving practical form to theoretical conceptions; and to Mr. L. Mayer, of the Tharsis Company, to Dr. Wallace, to Professor Dittmar, to Mr. Tatlock, City Analyst, and others, he owed much obligation. To Mr. Harvie, who made his first stove 25 years ago, as well as the working model then exhibited, he referred such persons as might wish to have a closer and more leisurely inspection and more detailed information.

An interesting discussion followed the reading of the paper, the first speaker in which was

Dr. W. Wallace, who said there were three requisites in a really good gas-stove—first, the products of combustion must be conducted away into a chimney or flue; secondly, the smallest possible quantity of air consistent with perfect combustion should be admitted, for the very obvious reason that the greater the proportion of air used in burning the gas, the greater would be the amount of heat carried up the chimney; thirdly, the products of combustion should be cooled down before passing off from the stove, so as not to leave in them any more heat than was necessary to cause a sufficient draught and prevent the condensation of moisture. He considered that Dr. Adams's apparatus fulfilled those conditions more completely than any other stove he had seen, and he had no doubt it would come largely into use for the heating of apartments. In one thing, however, he differed from Dr. Adams. The use of water at the top of the stove, to render the air more humid, he considered to be quite unnecessary. A gas-stove did not "dry the air" any more than an open fire did; and the air of inhabited rooms warmed by open fire-grates was seldom, if ever, found to be unpleasantly or unhealthily dry. Of course, those who did not wish moist air had only to omit filling with water the trough running round the top of the stove, and thus the provision for moistening the air was no objection whatever to the stove itself. He had to congratulate Dr. Adams upon his having brought to perfection an apparatus of great public utility.

Professor W. Dittmar, F.R.S.E., of Anderson's College, remarked that Dr. Adams's stove, to say the least of it, was founded throughout on sound scientific thought, and this, taking gas-stoves *as* gas-stoves, was giving it high praise. To select a set of "atmopyres" for the generation of the heat was the happiest choice that could have been made. The "atmopyre" offered this great advantage, amongst others, that it retained within itself, and thus localized at the right place, a considerable portion of the heat, which, in the case of a Bunsen burner, for instance, would get wholly diffused throughout, and be carried along with the large stream of gases and vapours resulting from the combustion of the coal gas employed in the stove; but in Dr. Adams's stove a considerable percentage of the heat necessarily retained by the combustion gases was coaxed out of them, and utilized by means of the system of circuitous canals through which they had to travel before they were allowed to reach the chimney, the heat abstracted assuming the form of a stream of pure hot air. Dr. Adams had so arranged matters that those gases reached the chimney with a temperature of 250° Fahr., for this reason, amongst others—namely, that the gases must be kept above 212° Fahr., at any rate, so as to prevent the condensation of the steam. In his (Professor Dittmar's) opinion this was a great mistake. The steam in the combustion gases being largely diluted with nitrogen, carbonic acid, and unconsumed oxygen, was at a tension of a mere fraction of one atmosphere, and consequently would stand refrigeration to a much lower temperature than 212° Fahr. It would condense only when cooled down below the temperature at which water boiled under the pressure of that fraction of an atmosphere. There was one other point on which he could not quite endorse the views of Dr. Adams. He referred to the Doctor's method for measuring the useful heat furnished by a gas-stove. He (Professor Dittmar) believed in the old established unit of heat; and the correct mode of measuring the utilized heat was, in his opinion, to determine the volume of combustion gases going into the chimney per unit of gas consumed, then to calculate from their temperature and composition the number of units of heat which they carried away with them, and to deduct that quantity from the total number of units of heat produced by the combustion of a unit of gas. If it had not been determined directly, that quantity could be calculated only from a sufficiently complete analysis of the gas.

Mr. Harvie, in reference to the high temperature of the escaping gases, stated that the high temperature of 250° Fahr. was necessary for the production of a sufficient draught.

After some remarks by Mr. W. P. Buchan, sanitary engineer, Mr. John Mayer, F.C.S., and Mr. G. W. Muir, coalmaster,

Mr. J. Hay, heating engineer, thanked Dr. Adams for having recognized in a healthy way the need for having a chimney in connection with gas-stoves for the discharge of the products of combustion, seeing that amongst them there were the usual poisonous gases. This was the more welcome, considering that for many years past there had been a constant succession of inventions in gas-stoves, in which the chief recommendation was that there was no smell, the combustion being so complete, forgetting all the while that the carbonic acid gas, being thus the more pure, was the more deadly. At all times there was an objection to the use of gas-stoves on account of the high cost, the estimated difference of cost being for gas six times that of common coal. Referring to the construction of the particular stove under consideration, he said that the combustion of the gas was well secured by the construction of the burner used by Dr. Adams; and in reference to some remarks on the subject of the high temperature of the gases discharged into the chimney, he said there was a distinct necessity for such a high temperature being maintained, because, if the gases entered the chimney at a low temperature, they were liable, by being further cooled, to lose their ascending power. In illustration of which he cited the experience gained many years ago in the use of the original Arnott stove, in which the heat was so thoroughly exhausted by the stove itself that the combustion often came to a standstill from the absence of sufficient power in the chimney. He quite thought the stove would have been much improved in its efficiency if the air to be heated were introduced into it at the lowest possible level, instead of descending from a high level, and still more if the air were drawn direct from the outer atmosphere.

Professor Dittmar again rose and directed attention to a point which, obvious as it was, had been left entirely unnoticed by other speakers who had dealt with the expediency or otherwise of impregnating the hot air furnished by the stove with water. He said that the absolute quantity of vapour of water contained in a given quantity of air was, of course, as had been correctly remarked by Dr. Wallace, absolutely independent of temperature; but it stood different to that which was meant when one spoke of the relative moistness of an atmosphere—namely, with the ratio of the water actually present to the maximum amount of water which could be present at the respective temperature. That ratio *did* get less when the temperature increased, and, consequently, Dr. Adams, who made provision for moistening the hot air issuing from it, was right, in principle, at any rate.

Dr. Adams replied. He said he had already explained that his method of estimating units of heat was only designed for the use of individuals who could not obtain or use the customary scientific formulæ. His suggested method gave fairly approximate values for the practical purposes of ordinary comparison. As to the high temperature at which the waste products were passed into the chimney, he considered this absolutely necessary in order to give them the requisite ascensional force. The late Dr. Andrew Ure, F.R.S., had pointed out that in slow-combustion stoves—which he designated "poison-vomiting coffers"—there was regurgitation of carbonic oxide and acid into the apartments from the chimney; and as the result of practical investigation made under Government instructions, he had reported that 300° Fahr. should be the minimum temperature. As to the provision made for supplying moisture, he (Dr. Adams) remarked that it could be used or not at pleasure. But it should be borne in mind that in this country about 80 per cent. of the amount of water necessary to saturate air was necessary for a healthy atmosphere. Air at 60° Fahr. contained about double the amount of moisture that could be held by air at 40° Fahr. But if air at 40° Fahr. was suddenly raised to 60° Fahr. it could not obtain the healthy amount of moisture unless through an artificial supply; indeed, the dry condition of a stove-heated room was one of the chief objections to the use of stoves. Moreover, for medical uses it was often requisite to have, and medical men were put to great shifts to obtain an extra moist atmosphere, as in some forms of asthma, in croup, &c.; while in other ailments, as bronchitis, some diseases of the larynx, and certain stages of consumption, a dry atmosphere was an important and much-desired therapeutic agent. If moisture were needed, his (Dr. Adams's) mode of supplying it was an improvement on ordinary methods, and it could be adopted or let alone at pleasure. Taking the supply of air from an upper stratum of the atmosphere was, in his opinion, a great improvement. If taken from the level of the floor there was caused a rush of "cold-footbath" currents of air, together with a cold floor, both of which were held to be hurtful by all sanitary authorities. There was also the fact that the interior of the stove did not get cooled, nor did the burners become choked up with any dust carried along the floor level. He also replied to Mr. Buchan in respect of the cost of the gaseous as compared with ordinary fuel. He said it was unnecessary to keep the stove burning continuously or at its full power, and it could be regulated quite as easily as an ordinary jet of gas for illuminating purposes.

A number of the members subsequently inspected the stove which Dr. Adams had in actual operation, and were much pleased with the arrangements for securing complete combustion of the gas used, and for getting an abundance of pure air sufficiently heated and moistened to distribute through an apartment.

PARIS GAS COMPANY.

At the Annual General Meeting of the above Company, held in Paris on the 25th of March, the usual report on the Company's operations for the year ending Dec. 31, 1879, was presented by the Board of Direction. It stated that further progress had been made in the consumption of gas over the previous year, but that the increase would have been greater had not the excessively cold weather which prevailed during the month of December caused considerable disturbance in the commerce and industry of Paris. The past severe winter was productive of very great difficulties for the Company, and although, during the month referred to, they were able to keep all their stations well supplied with raw material, maintain their plant in good working order, and discharge faithfully all the obligations imposed upon them, it had been done at great sacrifice, which had made a sensible diminution in the profits realized in the previous month. Of course the Company could have somewhat mitigated the effects of this state of things by raising the price of their coke; but the Directors bore in mind that as this combustible had come into such general use, and was the only heating material

employed by the most necessitous classes, it was unadvisable to impose a fresh cause of suffering upon that portion of the population which was most directly affected by the rising in price of articles necessary to life. The report then proceeded to give a detailed account of the Company's working during the year 1879, under the usual headings, as follows:—

GENERAL REVIEW OF THE COMPANY'S OPERATIONS.

Consumption of Gas.—During the year 1879 the Company sent out for consumption a volume of gas equal to 218,813,875 cubic mètres (7724¼ million cubic feet), being 6,864,358 cubic mètres (242,312,000 cubic feet) more than in 1878. During the year 1868, which was one following an Exhibition year, the consumption of gas increased to the extent of only 2,226,049 cubic mètres (78,650,000 cubic feet).

The day consumption of gas, which takes place between the time for extinguishing and the time for re-lighting the public lamps, figures to the extent of 53,539,638 cubic mètres (1890 million cubic feet), or 24·4 per cent., in the above total consumption, and exceeds by 4,862,035 cubic mètres (171,630,000 cubic feet) the corresponding amount in the year 1878. This day consumption, which is due principally to the use of gas for industrial and domestic purposes, has latterly made considerable progress. For example, in the four years 1875-9 it increased by 20 million cubic mètres (706 million cubic feet), while previously it had taken ten years—namely, from 1865 to 1875—to increase by a like amount.

Receipts for Gas.—The receipts from the sale of gas, which in 1878 amounted to 54,025,229 frs. (£2,161,009), in 1879 reached the sum of 55,619,588 frs. (£2,224,783). These receipts may be apportioned as follows between the two great divisions of the Company's area of supply:—

	Francs.	Sterling.
In Paris and its environs	52,000,886	£2,080,035
In the outskirts beyond the fortifications	3,618,702	144,748
Total	55,619,588	£2,224,783

Consumers.—The number of consumers on the 31st of December last was 139,230, exceeding by 7796 the number at the corresponding date in 1878. This is the first time in the Company's history that the number of fresh consumers has in a single year attained so high a figure.

Public Lighting.—The number of public lamps in use on the 31st of December, 1879, was—

In Paris and its environs	39,086
In the outskirts	7,046
Total	46,132

exceeding by 1128 the number in operation on Dec. 31, 1878. During that year the number increased by 2518.

*House Services.**—The number of house services laid on during the year 1879 increased to 1253, being 123 more than in the previous year, thus bringing up the total number in use on Dec. 31, 1879, to 12,913, distributed over 10,660 houses. Of these 1253 new services, 978 were fixed for the supply of apartments of which the occupants were willing to contract at once for a supply of gas to at least three burners, and 275 were laid on upon the application of landlords, who undertook, at their own expense, to fit up a minimum of three burners in three apartments. These 12,913 house services, exclusive of the branch-pipes, fittings, meters, &c., which are subject to a special payment, cost 7,726,875 frs. (£309,075), which is equivalent to an average cost, 598 frs. (£23 18s. 6d.) per service.

The receipts arising from the sale of gas consumed by means of these services in the year 1879 amounted to 8,229,106 frs. (£329,164), showing an increase of 747,330 frs. (£29,893), or 10 per cent., on the analogous receipts for the preceding year, which amounted to 7,481,776 frs. (£299,271).

With regard to the number of consumers supplied from house services, which, on Dec. 31, 1878, stood at 35,032, on the same date in 1879 it had reached 39,788, representing more than one-fourth of the total number of consumers.

Principal Results of Working.—The following table gives the quantity of gas manufactured from Jan. 1, 1856, to Dec. 31, 1879, the total of which is 3048½ million cubic mètres (107,612 million cubic feet). It shows that during the first 23 years of the Company's working, the annual consumption of gas has more than quintupled, and that the average annual increase, far from diminishing, tends, on the contrary, to grow larger in a very notable proportion. In fact, an examination of the table shows that the average increase in consumption per annum, which, during the first 14 years of the Company's concession, did not exceed 7,460,000 cubic mètres (263,338,000 cubic feet), has, during the 7 years which have just passed, reached 10,106,000 cubic mètres (356,741,000 cubic feet), which is higher than the preceding figure by 35 per cent.

Year.	Annual Consumption. Cubic Mètres. (1 c. m. = 35·317 c. ft.)	Annual Increase. Cubic Mètres. (1 c. m. = 35·317 c. ft.)	Annual Dividends. Francs.
1855	40,774,400	—	—
1856	47,335,475	6,561,075	40·00
1857	56,042,640	8,707,165	45·00
1858	62,159,300	6,116,660	50·00
1859	67,628,116	5,468,816	60·00
1860	75,518,922	7,890,806	70·00
1861	84,230,676	8,711,754	70·00
1862	93,076,220	8,845,544	85·00
1863	100,833,258	7,757,038	95·00
1864	109,610,003	8,776,745	105·00
1865	116,171,727	6,561,724	105·00
1866	122,334,605	6,162,878	110·00
1867	136,569,762	14,235,157	115·00
1868	138,797,811	2,228,049	120·00
1869	145,199,424	6,401,613	102·00
1870	114,476,909	30,722,520 dec.	40·50
1871	87,481,346	26,995,558 ,,	32·50
1872	147,668,331	60,186,985	51·00
1873	154,397,118	6,728,787	52·50
1874	160,652,202	6,255,084	55·00
1875	175,938,244	15,286,042	60·00
1876	189,209,789	13,271,545	62·00
1877	191,197,228	1,987,439	62·00
1878	211,949,517	20,752,289	65·00
1879	218,813,875	6,864,358	65·50

Manufacturing Power.—The manufacturing power of the Company's works, which, on Dec. 31, 1878, was 236½ million cubic mètres (8348½ million cubic feet), including that of the reserve plant intended to meet cases of accident, or any unexpected increase in the consumption, has varied but little. It has only been increased to the extent of 2½ million cubic mètres (88½ million cubic feet), which brings the total to 239 million cubic mètres (8436½ million cubic feet). At the close of the current year, when the works in progress at the Clichy station are completed, the manufacturing power of the Company's plant will be raised to 261 million cubic mètres (9213½ million cubic feet), which, after deducting the ordinary 10 per cent. for reserve, will give every security for the supply of gas next winter.

Canalization.—During the past year the Company's mains have been increased by 23,425 mètres, apportioned as follows:—

	Mètres.	Yards.
In Paris and its environs	13,684	14,962
In the outskirts	9,741	10,650
Total	23,435	25,612

Consequently, the total length of mains laid under the public roadways has been increased to 1,829,037 mètres, apportioned as follows:—

	Mètres.	Yards.
In Paris and its environs	1,289,549	1,409,907
In the outskirts	539,488	589,841
Total	1,829,037	1,999,748

These extensions of mains have, as usual, been made either at the request of the Municipal Authorities, or in compliance with the terms of agreements, though in some cases the work has been initiated by the Company, with the view of meeting demands for a further supply of light, or to improve the general condition of the network of mains.

EXPENSES OF FIRST ESTABLISHMENT.

It was announced last year that the Company's stations had reached the limit of their productive power, and that in order to satisfy the growing requirements of consumption it was necessary to construct entirely new works, which the Directors proposed to erect at Clichy, on a site between the River Seine and the Western of France Railway. During the past year, therefore, the Directors have confined themselves to the completion of the work absolutely necessary in the original works, and have concentrated all their efforts upon the new ones, which they expect to start working next winter. When this station is finished, it will produce annually 75 million cubic mètres (2647½ million cubic feet) of gas, which will correspond to one-third of the Company's total production.

The total amount expended on works of first establishment increased last year to 5,601,602 frs. (£224,064), apportioned as follows:—

Purchase of Land.

	Francs.	Sterling.
For enlargement of coke shed	70,000	£2,800
For enlargement of coal stores	123,500	4,940
Legal and other incidental expenses	31,891	1,270
	225,399	£9,016
Less value of land sold	147,266	5,890
Total	78,133	£3,126

Works and Plant at the Company's Stations.

	Francs.	Sterling.
La Villette	421,511	£16,860
Les Ternes	89,725	3,589
Passy	40,062	1,602
Vaugirard	124,772	4,991
Ivry	189,633	7,545
St. Mandé	33,746	1,350
St. Denis	25,514	1,021
Boulogne (Paris)	18,275	731
Maisons-Alfort	33,455	1,338
Clichy	1,760,019	70,401
Tar-works (La Villette)	136,471	5,459
Chemical-works (Ivry)	21,093	844
Miscellaneous	83,658	3,346
Total	2,976,934	£119,077
Extension of mains	594,892	£23,796
House services	802,745	32,110
Pipes and fittings	386,692	15,468
Meters	333,001	13,320
Vehicles	250,614	10,024
Tools and material	57,887	2,315
Miscellaneous	120,704	4,828
Total	2,546,535	£101,861
Total expenses of first establishment	5,601,602	£224,064

The general position of the account of expenses of first establishment may be thus stated:—

	Francs.	Sterling.
Amount expended to Dec. 31, 1878	175,280,203	£7,011,208
Ditto during 1879	5,601,602	224,064
Total on Dec. 31, 1879	180,881,805	£7,235,272
To meet which there is a capital of—		
In shares 84,000,000 frs.		
In bonds 111,745,739		
	195,745,739*	7,829,829
Balance in favour of the Company	14,863,934	£594,557

Loan of 1878.—The works intended to be carried out with the money authorized to be raised by loan in 1878, for the purpose of increasing the annual producing power of the Company's stations from 228½ million cubic mètres (8066 million cubic feet) to 261 million cubic mètres (9213½ million cubic feet), inclusive of the necessary reserve plant, were estimated to cost 25,885,291 frs., apportioned as follows:—

	Francs.	Sterling.
Purchase of land, extension of works, plant, &c.	12,150,000	£486,000
Mains, services, fittings, meters, &c.	12,450,000	498,000
Tools and materials, office expenses, &c.	1,285,291	51,412
Total	25,885,291	£1,035,412

The expenses incurred during the years 1878-79 amount to the sum of 11,021,357 frs., apportioned thus:—

	Francs.	Sterling.
Purchase of land, extension of works, plant, &c.	6,086,008	£243,440
Mains, services, fittings, meters, &c.	4,211,606	168,464
Tools and materials, office expenses, &c.	723,743	28,950
Total	11,021,357	£440,854

* These house services, called *conduites montantes*, are pipes carried from the bottom to the top of the buildings, for the supply of flats and separate apartments, as in Scotland.

* It follows from an examination of the balance-sheet that, out of a capital of 195,745,739 frs., there had been paid off, on Dec. 31, 1879, in shares, 9,429,250 frs.; in bonds, 9,960,737 frs.—total, 19,390,007 frs.—leaving 176,355,732 frs. to be redeemed.

Consequently, on the 31st of December last there remained a balance unexpended of 14,863,934 frs., apportioned as follows:—

	Francs.	Sterling.
Purchase of land, extension of works, plant, &c.	6,063,992	£242,560
Mains, services, fittings, meters, &c.	8,238,394	329,536
Tools and materials, office expenses, &c.	561,548	22,461
Total	14,863,934	£594,557

The total amount authorized to be raised by loan was 26,600,000 frs. (£1,064,000), and the difference between this sum and the estimated expenditure—viz., 714,709 frs.—has been applied in liquidation of expenses incurred previously to, and remaining unpaid on Dec. 31, 1877. The foregoing comparison between the estimated expenses and those actually incurred in the course of the past two years shows that the outlay has been well within the contemplated limits.

Working Account for the Year 1879.

Expenditure.

	Francs.	Sterling.
Value of gas in store on Jan. 1, 1879	21,767	£870
Materials used in Manufacture.		
Coals carbonized	18,110,842	£724,433
Coke and tar for heating purposes	3,616,146	144,646
	21,726,988	£869,079
Manufacturing Charges.		
Salaries and wages	2,576,086	£103,043
Maintenance of works and plant	1,581,170	63,247
Incidental expenses of distillation	1,033,976	41,359
Purifying material	295,400	11,816
General expenses	76,394	3,056
	5,563,026	£222,521
Cost of Distribution.		
Salaries of Engineers and Officers	1,112,715	£44,509
Repair and maintenance of mains and service-pipes	665,825	26,633
Allowances, premiums, &c.	20,127	806
Printing and advertising	141,211	5,648
Miscellaneous	54,705	2,188
	1,994,593	£79,784
General Management.		
Board of Direction and Executive Committee	150,000	£6,000
Salaries	814,877	32,595
Office and other expenses	170,287	6,812
Service, accidents, relief, &c.	164,743	6,590
Law and other charges	20,319	813
Rents and insurances	165,239	6,609
Interest on loans	5,317,075	212,683
Loan redemption-fund	1,728,000	69,120
Share ditto	1,389,500	55,580
Cost of experiments, &c.	128,993	5,160
Pension-fund	85,500	3,420
Provident-fund	111,407	4,408
	10,246,000	£409,840
Municipal Charges.		
Tax of 2 c. per cubic mètre of gas	3,804,342	£152,174
Rating of subsoil	200,000	8,000
Lighting, extinguishing, and maintenance of public lamps	519,752	20,790
	4,524,094	£180,964
State Charges.		
Taxes	543,808	£21,752
Stamps	124,113	4,965
Subsidy to Control Department	6,000	240
	673,921	£26,957
Total Expenditure	44,750,389	£1,790,015

Revenue.

Produce of the sale of gas	55,619,588	£2,224,783
Value of gas in store on Jan. 1, 1880	15,591	624
Retort coke	12,611,732	504,469
Furnace coke	455,948	18,238
Tar	2,609,600	104,384
Ammoniacal liquor	366,228	14,649
Rent of meters on hire	1,200,547	48,022
Rent of fittings, &c., on hire	1,172,301	46,892
Fire-bricks	209,841	8,394
Chemical products	1,153,596	46,144
Sundry works	169,016	6,761
Interests and discounts	644,505	25,780
Total Revenue	76,228,493	£3,049,140
Balance in favour of revenue, being profit made during 1879	31,478,104	£1,259,124
Add balance of profit from 1878	91,412	3,656
	31,569,516	£1,262,780
Deduct reserve to meet claims outstanding on Dec. 31, 1879	169,516	6,780
Balance, being profit available for distribution	31,400,000	£1,256,000
Deduct for share dividend	12,400,000	496,000
Balance divisible equally between the Municipality of Paris and the Gas Company	19,000,000	£760,000

The total amount available for distribution among the Shareholders is, therefore, as follows:—

	Francs.	Sterling.
Dividend, as per above account	12,400,000	£496,000
Moiety of balance, ditto	9,500,000	380,000
Seventh payment by the Municipality, in partial reimbursement of working expenses	50,000	2,000
Balance of profit to the credit of Shareholders	64,673	2,587
Total	22,014,673	£880,587
Deduct 1 fr. per share for special reserve-fund, authorized at the general meeting on March 23, 1875	336,000	13,440
Balance	21,678,673	£867,147
Deduct interim dividend of 12 frs. 50 c. per share paid in October last	3,798,013	151,921
Balance	17,880,660	£715,226
Deduct final dividend of 53 frs., making a total dividend for the year of 65 frs. 50 c. per share (250 frs.)	17,808,000	712,320
Net balance to carry forward	72,660	£2,906

Provident and other Funds.

Provident-Fund.—The object of this fund is to ensure to such of the Company's servants who, through sickness or accident, may be temporarily unable to discharge their duties, the medicine and medical attendance they may require; to provide them with funds during their illness; to defray the expenses of their interment in the event of their death; and to temporarily assist the widows and children of those who have died while in the Company's service. The fund is maintained by a deduction of 1 per cent. from the salaries of those who benefit by it, with the addition of an equal total amount provided by the Company. There are 20 medical gentlemen and 60 chemists upon the medical staff supported by the provident-fund.

During the year 1879 the medical staff visited 1390 patients, as well as attended 25,574 consultations. The medical fees, medicine, and other expenses in the year 1879 amounted to 228,819 frs. The account of the fund stands thus:—

Receipts.

	Francs.	Sterling.
One per cent. deducted from salaries, &c.	111,467	£4,459
Equal amount given by the Company	111,467	4,459
Interest and sundry receipts	6,490	259
Total	229,424	£9,177
Expenditure.		
Medical fees, medicine, &c., as above	228,819	£9,153
Excess of receipts	605	£24

In 1878 the receipts exceeded the expenses by 4605 frs. (£184).

On the 31st of December last this fund possessed 65 of the Company's fully-paid bonds, which had cost 33,042 frs. (£1322), and a cash balance of 5489 frs. (£219); thus bringing up to 38,531 frs. (£1541) the balance standing to the credit of the fund.

Pension-Fund.—This fund was instituted in 1858 for the purpose of pensioning off those officers of the Company who, having reached the age of 55, and given 25 years good service, might become incapable of discharging their duties. The capital required to maintain this fund consists of contributions from several of the Directors, who are desirous of assisting so useful an institution, and of an annual grant from the Company, the interest being capitalized. The officers do not contribute in any way whatsoever. As this fund cannot be drawn upon until the year 1881, the Company have, up to the present time, out of their funds granted various sums of money by way of periodical assistance, or as pensions to those old officers who, by their labour and devotion to the Company's interests, have merited such consideration.

The various sums from time to time placed to the credit of this fund amounted on Dec. 31, 1879, to 1,906,966 frs. (£76,279), represented by 20 of the Company's shares, 3910 of their bonds, partially paid up, 400 three per cent. bonds of the Eastern and Western of France Railways, costing altogether 1,895,619 frs. (£75,825), and by a balance in hand of 11,347 frs. (£454). The previous deduction of 4500 frs. (£180) made each year from the amount regularly set apart for this fund, for the purpose of granting pensions to, or temporarily assisting the Company's workmen and servants, under the circumstances indicated above, has for a long time been found quite insufficient. The Company have, therefore, had to supplement it by a grant of 69,950 frs. (£2798), thus forming a total of 74,450 frs. (£2978). In 1878 this subsidiary grant amounted to 68,963 frs. (£2758).

Savings-Fund.—This fund, which is of comparatively recent date, was instituted with the object of engendering thrifty habits in the Company's servants, by affording them facilities for putting away, without expense or loss of time, whatever they might be able to save each month out of their earnings. From the date of its formation up to the 31st of December last—a period of 3½ years—3109 accounts have been opened. The balance-sheet stands thus:—

	Francs.	Sterling.
Amount received on deposit	602,108	£24,084
Out of this sum there has been repaid—		
In cash to 2114 depositors, some of whom have left the Company's service	261,808 frs.	
In vouchers to 201 depositors whose payments exceeded 500 frs.	117,590 „	
	379,398	15,176
Balance in hand on Dec. 31, 1879	222,710	£8,908

Special Reserve-Fund.—This fund, which consists of a levy of 1 fr. per share per annum, was authorized by the Shareholders at the general meeting in March, 1875, for the purpose of providing a sum to compensate for the share of the undertaking that will be claimed by the Municipality at the end of the Company's concession. It stood as follows on Dec. 31, 1879:—

	Francs.	Sterling.
Amount paid into fund	2,016,000	£80,640
Interest	261,084	10,443
Value on Dec. 31, 1889, of the seven annuities due from the City of Paris, payment deferred till 1888	1,713,046	68,522
Total	3,990,130	£159,605

The first two amounts are represented by 3095 of the Company's fully paid-up bonds, by 2481 bonds on which 250 frs. have been paid, and by a balance in hand of 210,409 frs. (£8416). All these bonds having to be held by the Company and repaid at par, they constitute in reality a value of 2,167,750 frs. (£86,710), which exceeds by 101,075 frs. (£4043) their purchase price, thus bringing the actual total of the special reserve-fund up to 4,091,205 frs. (£163,648).

Coals, Residual Products, Etc.

Coals.—During the year 1879 the price of coal dropped to below that of preceding years. The Company profited by this decrease to renew upon satisfactory terms those of their contracts which were about to expire, and also to enter into fresh ones.

Retort Coke.—The sum realized by the Company's coke business, which in 1878 amounted to 13,585,445 frs. (£543,418), reached 12,611,732 frs. (£504,469) only in 1879. The reason of this decline was the exceptionally mild weather prevailing during the winters of the years anterior to 1879, which prevented the Company disposing of the whole of the coke produced at their several stations. The result was that the stock accumulated to such unusual proportions that ground had to be hired for the purpose of stacking the coke which encumbered the works. On Jan. 1, 1879, the quantity of coke in store was over 8¼ million bushels, and there was then a daily production, after deducting the quantity employed in heating the ovens, of nearly 110,000 bushels. Under the circumstances, therefore, the Company were compelled to reduce their price, and adopt other measures in order to prevent an increase of their stock. Furthermore, the heavy snowstorms of December last tended to complicate matters, and entailed expenses which could not possibly be avoided. However, as soon as traffic was re-established the Directors did their utmost to make up for any shortcomings which had been occasioned by the severe weather, and the activity they displayed was such that by the end of January their stock of coke was exhausted, leaving at their disposal only the quantity made each day. From Dec. 1, 1879, to the 10th of February last—a period of 72 days—the Company sent out a total quantity of nearly 11¼ million bushels of coke, being a daily average of 155,100 bushels. These figures need no comment.

Another cause of the diminution in the amount earned by the coke business was the depreciation in the value of this residual resulting from long stacking, and a consequent large production of dust. The Directors have ascertained, however, that the loss thus arising, when spread over the whole of the coke sold by the Company since the year 1871, does not amount to 10 per cent. They had, nevertheless, for some time given this matter considerable attention, and eventually determined on converting the coke dust into compressed fuel by the aid of pitch, and the result has been the production of a combustible material having a heating power about equal to that of coke itself. The Company's compressed fuel works, which have been in operation since 1873, have turned out 98,738 tons of this material, which have realized a profit of 1,481,000 frs. (£59,240). This amount would have been larger if the falling off in the demand for coke for several years had not interfered with the development of this new manufacture, by preventing the employment of compressed fuel for the heating of the retorts, except under the penalty of still further encumbering the works with coke. However, now that the stores are empty, the Directors reckon upon converting into compressed fuel a great part of the coke dust, and they hope thus to find some compensation for the unexpected misfortunes of last December.

Tar and Ammoniacal Liquor.—The quantity of tar and ammoniacal liquor resulting from the manufacture of gas at the several stations now exceeds 110,000 tons, and in order to ensure the sale of these residuals the Company are obliged to convert them into commercial products suitable for various requirements. Thus, in distilling tar, there are obtained pitch, which, mixed with breeze, is employed in making blocks of fuel suitable for heating locomotive boilers; heavy oils, used for the preservation of timber; and light oils, from which are extracted benzine, and the essences serving as bases for the preparation of colouring [illegible] ment of the ammoniacal liquor there are produced sulphate of [illegible] and other matters, which, either for agricultural purposes or for the manufacture of soda, find an easy and advantageous market.

The receipts arising from the treatment of the tar and ammoniacal liquor, the secondary products of which are sold at prices varying to a very considerable extent from time to time, amounted on Dec. 31, 1879, to 3,763,196 frs., divided as follows :—

	Francs.	Sterling.
Tar	2,609,600	£104,384
Ammoniacal liquor	1,153,596	46,144
Total	3,763,196	£150,528

This exceeds by 501,105 frs. (£20,044) the amount produced in 1878. In the previous year (1877) the contrary was the case; the produce of this branch of the Company's business was then 512,799 frs. (£20,512) below that of the preceding year.

Heating Appliances.—The number of appliances for heating by coke sold by the Company in 1879 was 2824, being 552 in excess of the number sold in the preceding year. This brings up to 49,619 the total number of these appliances which have been sent out of the Company's works, and nearly the whole of which are in use in Paris.

Gas-Engines.—During the year 1879 the Company sold 9 vertical engines on Otto and Langen's principle, and 82 horizontal Otto engines. In 1878 only 30 of the latter engines were manufactured and offered for sale by the Company. The quantity of gas consumed annually by the gas-engines at work in Paris may be estimated at 1,200,000 cubic mètres (42½ million cubic feet). The public are beginning to appreciate the advantages, for minor manufacturing operations, offered by these simple engines, which are so easy to work, so readily transportable, and, above all, so economical where intermittent power only is required.

[The report next dwells at some length on the action recently taken by some of the Syndical Chambers of Paris to obtain a reduction in the price of gas. The matter has already been referred to in the JOURNAL, and is at present under the consideration of a Commission appointed by the Minister of the Interior, on the requisition of the Municipal Council. The Company stand upon the rights accorded to them in their treaties with the City—treaties which, for the past 24 years, have been most faithfully carried out—and these rights cannot, they maintain, be set aside or modified without the consent of, and some compensation being made to the Shareholders.]

Improved Public Lighting.

In announcing, at the last general meeting of the Company, that some trials of an improved system of public lighting were about to be made, at the request of the Municipal Administration, in the Rue du Quatre Septembre, in the Place de la République, and in one of the pavilions of the Halles Centrales, the Directors added this remark: "These trials will demonstrate that gas, when burned in sufficient quantity in appliances suitably placed, is capable of producing a much more powerful concentrated illumination than is generally supposed; that its light is quite as susceptible of multiplication as of division; and that, for large as well as for small consumers, lighting by gas still remains *par excellence* the most practical and economic system of illumination." The public are now thoroughly satisfied of the possibility of obtaining, with gas, centres of light quite as intense as those obtained by means of the electric lamps in the Avenue de l'Opéra. The brilliancy, whiteness, and steadiness of the flame burning in the Company's new lamps in the Rue du Quatre Septembre excited general surprise. It was specially remarked that there was an absence of shadows around the vehicles in motion; and persons who were the least familiar with the subject of public lighting were able to form a correct idea of the difference between a rational system of illumination, conforming to scientific principles, and a system in which are employed very intense light centres, placed at some distance one from another, and presenting alternations of light and shadow which are so much the more marked in proportion as the space between the lamps and the brilliancy of the light are greater. In the Rue du Quatre Septembre the Company proposed to show that, at equal cost, gas affords a considerably better light than electricity. In the Place de la République they wished to prove that, with equal illumination, gas is less costly than the electric light. This they have done. Henceforth, whenever powerful luminous centres are deemed necessary, the use of gas for the purpose of obtaining them will be attended with the advantages of simplicity, adaptability, and cheapness. In conclusion, the Directors hope that the Shareholders will be gratified by the success of these experiments, and continue to share the confidence which the future of the undertaking inspires in each member of the Board.

ROCHDALE CORPORATION SEWAGE AND WATER WORKS.

Local Government Board Inquiry.

On Saturday, the 10th inst., Mr. C. Neale Dalton, one of the Inspectors of the Local Government Board, held an inquiry at the Town Hall, Rochdale, as to an application made by the Rochdale Corporation to the Board to partially amend, by Provisional Order, the Rochdale Water-Works Acts of 1847 and 1866, and the Rochdale Improvement Acts of 1853, 1872, and 1875, so as (among other things) to extend the powers of the Corporation in relation to the disposal of the sewage of the borough; to enable them to borrow further money for water-works purposes, and for the construction of sewers; and to postpone the time prescribed for the commencement of a sinking-fund for redeeming annuities created, and the repayment of money borrowed for water-works purposes.

Mr. Leresche (instructed by Mr. Z. Mellor, the Town Clerk of Rochdale) in opening the case on behalf of the Corporation, said the 88th section of the Rochdale Improvement Act, 1853, incorporated the Towns Improvement Clauses Act, and there was thus provision for the Corporation carrying sewage upon land, and for constructing works for the manufacture of manure. In the first instance the Local Government Board thought there was also power for the treatment of sewage for sale by means of irrigation and filtration; but as it was thought the words in the Acts of 1847 and 1853 were not sufficient to enable them to acquire lands for this purpose, it was suggested that they should obtain a Provisional Order.

The Inspector said there would be no difficulty in extending the Acts to enable the Corporation to acquire and work a sewage farm as desired. It would be necessary to draft a clause for the prevention of nuisances.

Mr. Leresche said this should be done, and explained that the power to acquire lands was desired in regard to land outside the borough; for, while the proposed sewage farm or works were inside the borough, they would have to go through some land just outside, in order to convey the sewage to the farm. He then turned to the main point of the inquiry, which was as to increased borrowing powers for water-works purposes, and an extension of time before the Corporation were required to provide a sinking-fund for the repayment of borrowed money. He explained in detail that the Rochdale Water-Works were originally the undertaking of a private Company, whose interests were purchased by the Corporation under the Rochdale Water-Works Act of 1866, the Corporation obtaining power to borrow £200,000 for water-works purposes. In 1872 they had power to borrow a further £100,000 for like purposes, and in 1875 a still further [illegible]

The Inspector: *Plus* the sinking [illegible] £500,000 old Company, which amount to——

Mr. Leresche said £180,000. The whole of the sums the Corporation had power to borrow had been borrowed, and now they wanted an extension of powers to enable them to complete the works. The execution of the works, in which very great and entirely unforeseen difficulties had been encountered, had been delayed, and they were now in this condition, with regard to the unfinished portion, that what money had already been expended upon them was unremunerative, and the works were useless until the Corporation were able to have them completed. They had arrived at the point when they must spend more money in order to make what they had already spent practically available.

Mr. C. Hawksley explained that the last observation of the learned Counsel only related to one reservoir.

The Inspector: As to the others, the several sums are being repaid. Are they all to be repaid by 100th parts, with the sinking-fund postponed until 1884?

Mr. Leresche: Yes.

The Town Clerk: And we want the commencement of the sinking-fund to be postponed a further ten years.

The Inspector: Have you any other powers under your local Acts enabling you to pay off your debt by any other means except by a sinking-fund?

The Town Clerk: No.

Mr. Leresche: That accounts for the double application. We now want more money to complete uncompleted works, and power to postpone the date for the creation of the sinking-fund. We have no money to complete works, and we are not receiving any revenue from the water-works, so we cannot provide a sinking-fund. Therefore, we have to make two applications—one to give us more money, and the other to postpone the time for creating a sinking-fund.

The Town Clerk: There ought not to be any sinking-fund at all required. The works will last for alltime when they are completed, and posterity will then inherit a valuable undertaking.

The Inspector: I can understand that you want more money; but what I want to know, in addition, is, how much more you do want, and what effect your proposed expenditure will have upon your works. How far will your proposed further expenditure go to improve your property, and make your works of permanent value?

Mr. Leresche: We want £75,000.

Alderman Shawcross: That is the sum necessary to complete the work. We have already had to levy a rate upon the ratepayers to cover a deficiency on the revenue account of the water-works.

Mr. Leresche: That deficiency is equal to about a 9d. rate.

Mr. *C. Hawksley*, C.E., was then called in support of the application, and, in answer to Mr. Leresche, said his firm had been Engineers in connection with these works since the formation of the old Company. In the construction of the new reservoirs at Cown Brook and Spring Mill unusual difficulties had arisen. There were also three old reservoirs of the Company still in use. One of the new reservoirs, that at Cowm, was

completed, and the other was in course of construction. Especial difficulties had been encountered at Cowm, the Engineers having had to go through 75 feet of quicksand. The cost of the two reservoirs up to the present time had been £348,000, including lands and compensation. Then there had been other sums expended in increased pipe lines and interest on the unremunerative works, making the whole expenditure £499,300. It would still require £75,000 to do the work immediately required. He produced an estimate of the several works representing this sum. The Cowm Brook reservoir had been brought into use, and was partially supplying the town with water, together with the old reservoirs; but the increase of population was necessitating the further supply which the completion of the Spring Mill reservoir would provide. The population was a growing one, and the demand had now nearly reached the limit of supply afforded by the present available sources. It was necessary to complete the Spring Mill reservoir without unnecessary delay. There had been already spent a sum of £121,631 upon this reservoir, and it was not yet in a state to enable water to be impounded. The difficulties that had been met with here consisted in the great depth to which they had been forced to carry the puddle trench beyond what they had calculated. They would require £35,000 to complete the works on this reservoir according to their calculations, and until it was completed the previous expenditure would be unremunerative. The water available from the Spring Mill reservoir would be 485,000 gallons per diem, so that not to complete the works would be to throw that yield away. The quantity available from the Cowm reservoir was 829,000 gallons per diem. In the sum of £121,000 mentioned in the estimate was included an item of £19,600 for interest on the cost of the works during construction, because the interest on that cost until the works were completed had to be paid out of capital in the usual manner.

The INSPECTOR said of course it was fair to say that until the works were completed they were losing the interest on £140,000 expended.

Alderman SHAWCROSS: Not only so, but the works cannot be made available.

The INSPECTOR: It would be right to say that until you get these works completed you are paralyzed. Do you say that your sinking-fund is to be paid out of the revenue derived from the water-works?

Alderman SHAWCROSS: Yes; or out of the rates, if the revenue is not sufficient.

The INSPECTOR: Is your application under this head to obviate the necessity of your providing any sinking-fund at all?

The TOWN CLERK said that was not their intention, but if he were asked his private opinion he should say that no sinking-fund ought to be provided, because it was a tax on the present for future generations.

Mr. LERESCHE: Mr. Hawksley, have you not found that in some cases Parliament has extended the time for providing a sinking-fund for such works as these?

Mr. *Hawksley* said he had. In reply to further questions, he said the Cowm reservoir was completed with the exception of one or two small details, and was yielding a large supply of water to the town—not to the full extent of its capacity, because the demands of the town and district did not yet put it to that test. But the demand was getting pretty near the extent of the supply from the present sources, including Cowm and excluding Spring Mill, which, as he had stated, was not brought into use. The Corporation supplied water for manufacturing purposes, but not to a great extent yet, though it was gradually increasing. He expected that the Spring Mill reservoir would be completed in the course of the ensuing year—1881. Estimating the supply at 15 gallons per diem when Spring Mill reservoir was completed, they would be able to supply a population of 133,000 people, with a proportionally increased demand for manufacturing purposes. The population now being supplied was about 100,000. Every house in the borough was not obliged to use the Corporation water, but the Corporation supplied large populations outside the borough, in some directions to the confines of the old parish of Rochdale. In one direction the parish extended to Todmorden, and they supplied water almost to the top of the hill separating this from the Todmorden Valley watershed. [illegible] values of [illegible], your actual demand.

The *Chairman* [Hawksley], in reply to Mr. LERESCHE, said he considered it a very reasonable request that the time for creating the sinking-fund should be extended until 1894. This sinking-fund principle pressed very hardly upon the present generation, by compelling them to provide a free water supply to the population of the future; and if the works had remained in the hands of the old Company, there would have been no sinking-fund created, and the debt would have remained a debt for ever, which, in works of this character, appeared to him to be proper. But Parliament had thought otherwise, and established the principle of providing such a fund in connection with all works executed by public authorities.

The INSPECTOR: Have you anything to say with reference to the permanence of the works?

Mr. *Hawksley*: Only that they are constructed in the most substantial manner. No expense or means have been spared to secure their permanence. The works in this case are, I should say, everlasting, and will require but a comparatively small outlay for repairs.

The INSPECTOR: It seems to me that they would be adequate in capacity to meet any increased demand for the next 40 years.

Alderman SHAWCROSS: You must take into account the manufacturing demand, which is likely to increase in much greater ratio than the population demand.

Mr. *Hawksley*: If it had not been for the bad trade, more water would have been required for manufacturing purposes already. With the revival of trade both the population and manufacturing works will increase rapidly. There is no limitation of supply; there is stringent suppression of waste, and the supply per head per diem is under 14 gallons, including the supply for manufactures. Under Mr. Rofe (the Manager of the water-works), it is only between 11 and 12 gallons per head per diem. Although these works were authorized to be constructed in 1866, such difficulties have arisen that some of the works have only recently been completed, and therefore the Corporation are only just realizing a portion of that benefit they would sooner have derived if the works had been completed earlier. This has some weight in enforcing the reasonable demand for delay in providing the sinking-fund. In addition to the rates charged for water, the town has to make up a deficiency of £9000 per annum on these works, and that sum will be increased when the Spring Mill reservoir is completed, and that expenditure falls upon revenue instead of upon capital, as at present.

Alderman SHAWCROSS: The moment the Spring Mill reservoir is completed we shall have £6000 a year more to pay.

Mr. LERESCHE: That will be equivalent to another 6d. rate.

Mr. HEDLEY: And with the present rate of 9d. to make up the deficiency of £9000, that will equal a water-rate of 15d. in the pound altogether.

Alderman SHAWCROSS: And when the sinking-fund comes into operation it will put another £5000 or £6000 upon that deficiency.

Mr. LERESCHE said the rates were only paid by the inhabitants within the borough, while outside the borough many thousands of people were supplied with water who did not bear any portion of the rates which the borough ratepayers bore in addition to the charges made for water.

The INSPECTOR: But do you not charge a higher price to consumers outside the borough?

Mr. *Rofe* put in a list of charges, giving a negative answer to this question.

The INSPECTOR then asked if there were any other matters to be laid before him, and no response being made, he said he should consider the inquiry closed. There would not be much time now to prepare for the Provisional Order which the Corporation would require, and in regard to the sinking-fund, he thought it would be well to have introduced into it the clauses of the Local Loans Act.

The inquiry then terminated.

SINGAPORE GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held at the City Terminus Hotel, London, on Tuesday last—H. P. STEPHENSON, Esq., in the chair.

The SECRETARY and ENGINEER (Mr. Robert King) read the notice convening the meeting, and the following report was taken as read:—

The Directors have to report continued progress in the lighting of Singapore, for particulars of which they refer to the report annexed, from their Engineer and Manager (Mr. E. J. Wells), dated Feb. 9, 1880.

The Directors going out of office by rotation are Messrs. Robert Stannard Foreman and Henry Palfrey Stephenson; and these gentlemen, being eligible, offer themselves for re-election. The present Auditors (Messrs. William Thomas Morrison and Alfred Williams) retire from office according to the articles; and, being eligible, offer themselves for re-election.

The balance-sheet to Dec. 31, 1879, appended to this report, shows the financial position of the Company. The Directors have written off for depreciation of works and plant, and off the expenses of first establishment, as per balance-sheet, at the rate of 1 per cent. per annum, and £109 for depreciation of fittings. The profit for the half year, after writing off these sums, amounts to £2474 19s. 6d., which together with £816 6s., the unappropriated profit of the preceding half year, makes the available balance £3291 5s. 6d. Out of this sum the Directors recommend the declaration of a dividend at the rate of 7½ per cent. per annum, less income-tax, on the preference capital, and at the rate of 8 per cent. per annum, less income-tax, on the ordinary capital; the balance of £848 16s. 10d. to be carried forward to the profit of the succeeding half year.

Report of the Engineer and Manager.

Gas-Works, Singapore, Feb. 9, 1880.

Gentlemen,—I had the honour to forward you, by the Brindisi mail of the 3rd inst., the several statements, banker's voucher, and balance-sheets, showing the working for the half year ending Dec. 31, 1879. I hope you will regard the accounts that are submitted as satisfactory, and that they will be found correct. As all the accounts are fully detailed, as usual, it is unnecessary for me to go into figures with the exception of one or two important points.

The loss by exchange for the half year has been £789 13s. 6d. on £4350 remitted, and the whole of this loss has been charged to revenue account. The average rate during the half year has been 3s. 9¼d. per dollar. It may have been remarked that, notwithstanding our increased gas-rental, the profits increase very slowly. The following figures will, I think, clearly show the cause of this:—Taking the last seven years, the loss by exchange has been—1873, £132; 1874, £490; 1875, £692; 1876, £771; 1877, £1001; 1878, £1411; and 1879, £1825; the last year showing a loss on account of exchange of nearly 11 per cent. of our total receipts.

In the retort-house, Nos. 6 and 7 benches of retorts have been re-set with 7 oval retorts in each, and are ready for use when required. No. 4 bench is being re-set with 3 oval and 4 D retorts, which I had in stock, and have utilized.

In the purifying department all is working satisfactorily. The gas has been kept free from impurities, and its illuminating power fully up to the standard, and the supply has been equal to the demand; the efficiency of the works and plant generally being fully maintained.

An extension of mains for 8 new public lamps has been carried out in Neil Road, and a 5-inch main has been laid in Scott's Road, in place of the 3-inch main laid originally, which was not large enough to supply the Club and European houses in that district. A re-arrangement of the mains supplying the Fort has had to be made in consequence of the meter being removed to allow of the erection of the new flagstaff.

The Campong Malacca district is being rapidly built upon, and extensions of mains will soon be necessary. The Teluk Ayer Bay reclamation has been commenced. This will form a continuation of College Quay to the Tanjong Pagar Dock, and will form quite a new town when completed.

The unaccounted-for gas [illegible] amounted to 12 per cent. This includes the half year the new Exchange and Club and the Masonic Lodge have been lighted up satisfactorily. The new flagstaff has also been fitted up for the harbour light with two of Sugg's 50-candle burners and with reflectors. The light given is clear and bright, and is visible upwards of 20 miles. There have been 28 buildings fitted up with 556 lights, making a total of 652 houses in which gas was consumed on Jan. 1, 1880. 13 additional lamps have been ordered to be erected by the Commissioners in districts where mains are already laid, and one public bathing-place is also to be lighted, and the fitting up is in progress. The two Sugg's lamps mentioned in my last report arrived safely, and were erected in prominent places. They give general satisfaction.

I regret to have to report the serious illness of my assistant in this department. He has been unable to attend to his duties for more than a month past, and the medical men entertain serious doubts of his recovery.

I have lately tried some Takisima (Japan) coal, and have found it a very good coal for the production of gas and coke. Five hundred tons of this coal have been purchased.

You will observe that the stock in hand has been reduced by £1497 during the half year, and I hope it may be further reduced in the future.

(Signed) E. J. WELLS, Manager.

Dr. *Balance-Sheet, Dec. 31, 1879.* Cr.

Capital—				Works & plant June 30, 1879	£45,544 17 6
2,000 preference shares, £5 paid	£10,000	0 0		Extensions this half year	76 5 0
10,597 ordinary shares, £5 paid	52,985	0 0			£45,621 2 6
Debenture bonds	350	0 0		Less amount written off.	227 14 6
Sundry creditors	435	17 9			£45,393 8 0
Insurance reserve-fund	215	11 6		Purchase of land	1,118 2 8
Profit and loss.	3,291	5 6		Cash at Bankers, London and Singapore	1,088 3 9
				Cash in hands of Secretary.	7 11 8
				Bills receivable	2,150 0 0
				Office furniture	84 14 6
				Retort account	779 2 9
				Stock on hand.	10,669 18 10
				Gas and meter rental, &c.—	
				Due to Dec. 1	4,141 19 7
				Due for the month of Dec.	1,844 13 0
	£67,277	14 9			£67,277 14 9

Dr.—*Profit and Loss Account, from July 1 to Dec. 31, 1879.*

Coal carbonized	£2,435	7 11		Balance at profit and loss, June 30, 1879	£3,129 0 7
Lime and oxide	22	11 0		Less amount declared as dividend	2,312 14 7
Trade and general charges.	467	6 2			£816 6 0
Rent, rates, and taxes	151	10 10		Gas and meter rental	6,869 8 10
Directors and Auditors	310	10 0		Products, profit on fittings, and sundries	1,814 5 6
Salaries and Collectors commission	849	16 10			
Wages	438	5 5			
Interest on loans and debentures	25	15 10			
Loss on exchange	789	13 6			
Bad debts and allowances	80	2 0			
Retort account	170	0 0			
Meter repairs and renewals.	75	0 10			
Depreciation on works, plant, &c.	327	14 6			
Office furniture	5	0 0			
Balance, profit	3,291	5 6			
	£9,440	0 4			£9,440 0 4

The CHAIRMAN, in moving—"That the report, with the balance-sheet attached thereto, be received, adopted, and entered on the minutes," said he did not know that it was necessary at this meeting to go through all the items of the accounts, but the Shareholders had the usual form before them, and he should be very happy to answer any question that might occur to any one present. As they saw, they were in a rather better position than on former occasions. They were in a sufficiently good position to induce the Directors to declare an improved dividend, and looking to the fact that there was £800 odd of undivided profits carried forward, after the usual writings off, they might, if the proceeds from profits fell short, be able to keep up the dividend out of the balance carried forward. There was only one other matter he had to call attention to, and that was the extensions that were going on in the town of Singapore. Their Engineer and Manager at Singapore had sent them a plan, which showed that a considerable amount of building was going to take place on what they called the new Campong Malacca. This was, in fact, nearly carried out, and they were going to erect new lamps, and would thus get a considerable number of private lights in addition. The Teluk Ayer Bay reclamation was only just commencing, and this practically was the building of an annex to the town of Singapore. A new quay wall was going to be made, and a certain amount of land would be reclaimed from the sea. The Shareholders would observe on the map the new streets that were going to be made, and the Company would get a considerable addition to their private lights from this source. There was also to be a new road made to the Tanjong Pagar Dock, and altogether, to his mind, things looked exceedingly satisfactory as regarded future progress in Singapore.

Mr. R. S. FOREMAN seconded the motion, and it was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. FOREMAN, the dividends recommended in the report were declared.

Mr. ALFRED WILLIAMS then moved, and Mr. ROBERT RICE seconded the re-election of the retiring Directors, Mr. R. S. Foreman and Mr. H. P. Stephenson, and the motion was carried unanimously.

Mr. FOREMAN having expressed his thanks for the continued confidence of the Shareholders in his colleagues and himself,

Mr. H. W. SMITH proposed, and Mr. JOSEPH MANWARING seconded the re-election of the retiring Auditors, Mr. William T. Morrison and Mr. Alfred Williams, and the motion was carried unanimously.

The CHAIRMAN then moved the usual vote of thanks to the Company's Engineer and Manager, and to the Local Committee at Singapore. He said as the Company progressed year by year—they did not progress very rapidly, but they did progress, he hoped, to the satisfaction of all the Shareholders—they were more impressed with the fact that they had a most excellent Manager at Singapore. When he looked at some other foreign Companies, many of them wrecked through the incompetency, and others through the dishonesty of their Managers, he congratulated this Company that for so long a period they had had the services of Mr. Wells.

Mr. WILLIAMS seconded the motion, which was carried unanimously.

Mr. MORRISON then returned thanks for the re-election of the Auditors, who, he said, were delighted at the steady progress of the Company. He moved a vote of thanks to the Chairman and Directors for their very able administration of the affairs of the Company.

Mr. RICE seconded the motion, and it was carried unanimously.

The CHAIRMAN expressed the acknowledgments of his colleagues and himself at the compliment. He said that they had now what he might call a steady task before them. They tried to make as much profit as they could, and they did not divide profit unless they had made it. If the Directors made profits, the Shareholders would receive dividends; but if they did not make any, there would not be any dividends. He hoped if bad times came on them the Directors would be honest enough to come before the Shareholders and state that they had not made sufficient to pay a dividend.

Mr. RICE then moved a vote of thanks to the Engineer and Secretary, saying that Mr. King had occupied his position for some years, and the Shareholders had found him ready on all occasions to afford them any explanation they required.

Mr. MANWARING seconded the motion, and

The CHAIRMAN, in putting it, said he could quite endorse what had been said of Mr. King.

The resolution was carried.

Mr. KING briefly returned thanks, and the proceedings terminated.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district continues very dull, and all descriptions of round coal are both low in price and bad to move. As a rule, the orders coming to hand are not sufficient to keep the pits going more than three to four days a week, and at many of the collieries heavy stocks are held. It is difficult to say in which class of round coal the depression is most felt. Of course, there is considerably less demand for house-fire coals. Best coals are now moving off very slowly, and although it is chiefly in the lower qualities that the consumption has fallen off, this is only partially met by the slightly improved demand for common round coals for steam and forge purposes. The result is that both best and common round coals are plentiful in the market, and there is every probability, as I have pointed out in previous reports, that gas coal consumers will be able to cover their requirements on very favourable terms. There are still but few inquiries coming to hand, and these are scarcely sufficient to fairly test the market. Indeed, so far as I can ascertain, there are at present really no fixed prices; sellers, although not caring to commit themselves to any very long forward deliveries, not feeling themselves strong enough, in the face of the competition in the market, to hold out firmly for any stated figure. It does not, however, seem likely that ordinary Lancashire gas coals will fetch more than about 6s. per ton, and good Arley gas coals more than 7s. 6d. per ton at the pit. So far as ordinary quotations are concerned, they may be given about as under:—Best Wigan Arley, 8s. to 8s. 6d. per ton; common sorts and Pemberton four-feet, 6s. to 6s. 6d.; and common round coal, 5s. to 5s. 6d. per ton at the pit. Engine classes of fuel continue firm, owing to the scarcity of slack, and the average prices now being obtained at the pit are about 4s. to 4s. 6d. for good burgy, 3s. 6d. to 4s. for best slack, and 2s. 6d. to 3s. per ton for common sorts.

There has been rather more coal going away for shipment, for low prices have, as a rule, to be accepted to effect sales.

In the iron trade of this district there has been something pretty nearly approaching a panic during the past week, and prices have gone down so rapidly, without any indication that the downward movement would be arrested, that speculative holders of iron have taken alarm, and in many cases there has been an endeavour to force sales of second-hand lots at almost any figure. Lancashire makers of pig iron, finding it hopeless to attempt to meet the market in its present condition, have practically withdrawn their quotations; but they are open to offers, and local pig iron delivered into the Manchester district could now be bought at about 60s. per ton, less 2½ per cent. Finished iron is also weaker, and although very few of the makers are as yet under the necessity of pressing for orders, lower prices would be taken. Bars delivered into the Manchester district could now be bought at from £7 12s. 6d. to £8 per ton, and other descriptions of finished iron in proportion.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The best gas collieries in the county of Durham are very well employed in the shipments of coals, sold under contract, to the larger ports in the Baltic. This business is likely to be active until the end of June. Gas coals have likewise been shipped to the Italian ports of the Mediterranean and to the Black Sea. Gas coals have likewise been in request for the nearer ports of Europe, especially for Norway, Sweden, Denmark, and the North of France. The price of gas coals is unaltered. In the present circumstances of the iron, chemical, and other local industries in the county of Durham, it is found very difficult to uphold the price of most descriptions of coals. Latest quotations are therefore nominal. Second and inferior gas coals are bad to sell, and the price of coke is lower. The same observation applies to steam coals as to gas. The best steam collieries maintain a nominal quotation, but regulate the price and sales by discounts. Manufacturing coals keep in fair demand from the local factories. A little more money has had to be paid for special sorts upon the contracts which have been made for the second half of 1880.

Coasting shipping freights show very low quotations. Sailing vessels, to load gas coals for the English Channel ports and for the North of France, experience much difficulty in entering upon charters which will pay. The supply of coasting tonnage was much in excess of the requirement of trade last week. Several small sailing ships were unable to find freights. Coasting rates are about 3d. per ton down.

The collapse of prices in the Cleveland iron district is materially affecting trade all round. In the North of England general business is very flat and dull. Prices cannot be upheld. The chemical market is especially disappointing this spring. It shows that there has been over-speculation. Several middle men are likely to lose pretty heavily upon the chemicals they bought for April delivery. The only article which showed an advance last week was bleaching powder. There was a rise of half-a-crown a ton upon it. Other chemicals were, if anything, lower in price than they were the week before, with a wretchedly poor demand. The prospects of the trade further on are not good either. The shipments of fire-clay goods and fire-bricks continue to be upon a large scale. There is a strong demand from the Continent. A satisfactory business in fire-bricks is also done with America. Lead and copper are not so much asked after. The latest sale of rich Spanish lead which occurred at Newcastle last week was at £16 10s. per ton. The importation of Baltic timber has commenced for the season. Like in almost every other trade, there were great expectations in January of a heavy rise of prices. These have been grievously disappointed. Some large speculative transactions took place in the trade in January. Prices were forced up for a time by operators; but the public would not buy. Many of the outsiders who bought up cargoes and tried to force the markets for their own advantage have lost considerably on the transaction.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At a meeting of the Forfar Gas Commission, held on Monday, the 19th inst., a discussion arose about the purchase of two annuities that had been offered for sale, in the course of which a desire was expressed by Mr. Craik to know where the money to purchase them was to come from. The Clerk replied that it was to come from the bank, and Bailie Laird said it was from the sinking-fund. But Mr. Craik said they had no sinking-fund, and that it was an illegal working of the Gas Act to borrow more. At a later stage of the proceedings the same gentleman further dilated on the practical non-existence of the sinking and contingent funds, and said that instead of getting additional borrowing powers from Parliament they should raise the price of gas. He, for one, would never consent to go to Parliament. The offer of the annuities was declined by a majority of votes—six against five.

At last week's meeting of the Police Commissioners of Greenock, the minutes of the Gas Committee were under consideration, and in the course of the discussion upon them, Provost Campbell said that, along with the Chamberlain, he had been looking into the financial position of the gas-works, and he feared that the probable surplus revenue, as shown to the Trust last September, would not be borne out, but that there would be a falling off in the expected surplus. He called attention to the matter in order that the Gas Committee might, if possible, economize, and so that the statement made in September as to the profits from that source might be borne out. They did not like to have a falling back in any department of revenue, and he hoped that Bailie Shankland (the Convener) and the Committee would give attention to the matter.

At their last meeting the Paisley Gas Trust resolved to accept an offer from a local firm of gas engineers for the reconstruction of the gasholder which was damaged by the great storm (the Tay Bridge storm) at the end of last year. The cost is to be about £500. It is estimated that the surplus profits for the year ending the 15th prox. will not only meet this item of outlay, but also provide £1000 for town improvement purposes, and still leave at least £1000 to the good. Certainly the gas supply undertaking of Paisley is well managed.

In connection with the late elections I may mention that the author of the Burghs Gas Supply (Scotland) Act (Sir Windham Anstruther, Bart.) has failed to secure his return to Parliament for South Lanarkshire, having been beaten by a very decisive majority by Major Hamilton, who previously represented the same division of the county in the House of Commons.

A Dundee labourer named Brown, and his family, consisting of his wife and mother-in-law, and a child three months old, narrowly escaped being poisoned by means of gas last Tuesday week. The family, who reside at James Street, Maxwelltown, Dundee, retired to rest about nine o'clock on the Monday night. At that hour no smell of gas was perceived, but about one o'clock on the following morning Brown awoke in a sort of stupor, and found the house filled with gas. He immediately roused his family, all of whom were suffering more or less from the effects of gas poisoning, and had them removed to the house of a neighbour. A gas inspector was thereafter called, and the leak, found to be in a pipe in the wall, was stopped. The family are now recovering satisfactorily.

Another narrow escape from death by inhaling coal gas has just been recorded. On Saturday week a joiner, named Robert Orr, came from the country into Selkirk, and on Sunday morning he was found in a state of utter unconsciousness, and, indeed, apparently lifeless. He is a young man, and being unaccustomed to the use of gas, he had gone to bed about ten o'clock on Saturday night, after extinguishing the gas, but leaving the stopcock open. Not answering to a knock at his bed-room door about eight o'clock on Sunday morning, the door was opened, and a strong smell of gas was perceived, while Orr lay in bed quite motionless. The doors and windows of the house were at once thrown open, and in a few minutes a medical gentleman was in attendance. The case seemed to be a

hopeless one, nevertheless the doctor proceeded to employ artificial respiration, but it was not till that had been done for three-quarters of an hour that signs of life became apparent. Gradually the patient so far came round as to be able to take stimulants, and in the afternoon the doctor considered him to be out of danger.

In consequence of a flood in the Clyde, the like of which, it is said, has not been known for the last forty or fifty years, the gas coal workings at Clydegrove Colliery, near Wishaw, were drowned out, the waste having been filled by the overflowing waters. The pit was sunk quite recently.

At the last meeting of the Town Council of Port Glasgow, it was reported that the new reservoir at Auchendoors, computed to contain about 120 million gallons of water, was filled to within 2 feet of its capacity. The Leperston reservoir has a capacity of about half that quantity.

A meeting of the Annan Police Commissioners was held the week before last, at which a letter was read from Messrs. Gibson and Strathearn, Edinburgh, agents to the Duke of Buccleuch, stating that his Grace was ready to enter into a friendly reference with the Commission as to certain land required by the latter in the parish of Middlebie for the construction of a reservoir. Mr. Drennan, Ayr, was appointed valuator on the part of the Commissioners. It was resolved to adopt the larger reservoir recommended by Mr. Gale, the Engineer, and 16½ acres of land will consequently be required. It was resolved, however, to intimate to the Public Works Loan Commissioners that £8000 would be required for sanitary purposes this year, £2800 for drainage, and £5200 for water.

It was reported at the last meeting of the Galashiels Town Council that there was reason to believe that the operations undertaken with the view of stopping the leakage in Knowes Dean reservoir had been successful.

A water supply scheme, estimated to cost about £5000, is about to be proceeded with for Bonhill and Jamestown, in the Vale of Leven. It is reported that the water is of such a quality that filtration will not be required.

At last Tuesday's meeting of the Greenock Water Trust the Superintendent submitted his statement of water in store. It showed the amount of water to be 446,704,864 cubic feet, or a supply sufficient for 127 days for all purposes. It was reported that the Loch Thom Extension Works had cost, up to the 1st inst., £8101 5s. 2d., and the Provost remarked that when they were completed the storeage for water would be so much increased that there would never be any danger of the water supply running short, as had formerly been the case when they had a hot and dry summer.

The quarterly report on the condition of the Aberdeen Water-Works, which has just been issued, states that six important repairs to the aqueduct were made in the course of the three months, requiring the cutting off of the water in each case for some eight or nine hours; besides which there were 15 cases of minor repairs to culverts, &c. The depth of water in the Invercannie reservoir varied during the quarter from 12 ft. 4 in. to 14 ft. On 64 days the state of the river is reported as "very clear," on 16 days as "clear," on 11 days as "brown," while during one day the river sluices had to be shut, no water being taken from the river on account of its muddy state. As usual, the consumption of water was measured for one day, when it was found that in 24 hours 4,262,890 gallons were consumed—4,055,200 gallons from the low service reservoir, and 207,690 from the high service reservoir. The inspectors of the private water supply in the city found 829 cases in the course of the quarter where it was necessary to enforce repairs.

The Chairman of the Bothwell Local Authority reported to a meeting of that body, held last Tuesday, that the gross outlay on account of the water supply scheme now in progress (including everything except the cost of the loan) was £35,335 9s. 8d., and suggested, as they did not know what changes there might be, that power should be taken to borrow £40,000. A representative of Messrs. H. Salter and Sons, financial agents, Glasgow, was present, and explained the offer of his firm to lend the money at 4½ per cent. interest, under an annuity scheme by which the whole would be repaid in 30 years. It was stated by the Chairman that every available source, including the Public Works Loan Commissioners, had been unsuccessfully applied to in the endeavour to get the money at a cheaper rate. His suggestion was agreed to.

Lately there has been a great amount of a low type of typhoid fever or diarrhœa in Perth, and a feeling arose that it was due to impurities in the public water supply. A Committee of the Water Commission had the subject under consideration, and on Tuesday last they took samples of water from the filter well at Moncrieffe Island, the reservoir at Wellshill, and a street well, all of which they forwarded to Dr. Wallace, of Glasgow, who is the Public Analyst for the city.

There was quite a run down in prices in the Glasgow pig iron market last week, and an enormous amount of business was done. The fall on Friday was 1s. 6d. per ton, making on the week a decline to the extent of 5s. 9d., or more than double the amount of the decline during the preceding week. The week closed with prices at the lowest—46s. 9d. cash, and 47s. one month for sellers, and buyers near. There is as yet no sign of the fall being arrested, and far less is there any indication of recovery. The most utter hopelessness prevails, and holders are clearing out on all hands. The price is now very low, and there is no doubt that investments in iron will ultimately pay handsomely. A number of large losses have lately been incurred, rumours putting some of them down at £10,000, at the least. It is feared on some hands that the depression will be overdone.

The Glasgow coal market continues to be dull. Orders are scarce for all descriptions, excepting for steam coal, which is a little more in demand. Prices rule low.

The annual meeting of the Association of Municipal and Sanitary Engineers will be held at Leeds on the 27th, 28th, and 29th of next month.

Aylsham Gas Company, Limited.—The Directors of this Company have just declared a dividend of 5 per cent. and a bonus of 5s. per (£10) share.

Carmarthen Water Supply.—The Carmarthen Town Council last Tuesday rejected several proposed schemes of water supply by gravitation, and resolved upon an extended pumping system, similar to that which has been in use by them during the last 12 years.

The Water System of New York.—According to the *Scientific American*, the Department of Public Works has during the past four years added to the Croton water service 70 miles of distributing-pipes, making the present extent of pipes 480 miles. The Croton aqueduct supplies 95 million gallons a day. The elevated railroads consume over half a million gallons daily.

Wokingham Water Supply.—On Wednesday last the boring by the Wokingham Water Company reached a stratum of chalk at a depth of 340 feet from the surface, thus placing beyond doubt that an abundant supply of pure water will soon be available for the inhabitants of the town and of the large district embraced in the Company's scheme, which includes Binfield, Barkham, Sandhurst, Bracknell and neighbourhood.

Sales of Gas and Water Shares.—Last Tuesday £250 of stock in the South Shields Gas Company was sold by auction in lots of £10 each, and realized prices ranging from £13 10s. to £15 per lot. At Grantham last week 20 shares in the Local Water-Works Company were sold by auction (the dividends accruing due in June next being included), at the following prices:—15 at £21 12s. 6d.; 2 at £21 15s.; 2 at £21 17s. 6d.; and 1 at £22.

Minster (Thanet) Gas Company, Limited.—The annual meeting of this Company was held on Thursday, the 15th inst.—Mr. D. Swinford in the chair. The Company was established in 1863 with a capital of £1500. They are, however, in a very flourishing condition, and have declared a dividend of 7 per cent. for the past year, with a balance to carry forward. The price of the gas will be reduced to 5s. per 1000 feet next quarter. Votes of thanks to the Chairman, to the Secretary (Mr. R. Bubb), who has held office since the establishment of the Company, and to the Auditor were passed.

Waverley Association of Gas Managers.—The ordinary half-yearly meeting of this Association was held at Melrose last week. A financial statement was laid before the members, and, it being favourable, was unanimously approved of; after which it was resolved to hold the next meeting at Berwick-on-Tweed on the second Wednesday of September. Mr. Hall, of Berwick, was unanimously appointed President for the year. The burner question was then taken up and discussed, and, in connection therewith, Mr. David Young, of Dalkeith works, made some beautiful and interesting experiments with several new burners constructed for special purposes. These were much admired and highly approved of. The members, of whom there was a large number present, and their friends afterwards adjourned to the Crown Hotel for dinner, and spent a few hours agreeably together.

Bolton Corporation Water Supply.—The *Bolton Chronicle* says: "It is gratifying to be able to announce that an arrangement is likely to be come to whereby nothing more will be heard of the arbitration case, *Hoare v. The Bolton Corporation*, which has been pending for several years, and the hearing of which was to have been resumed on Tuesday, the 27th inst. (to-day), before the sole Arbitrator, Mr. Staveley Hill, Q.C., at the Surveyors Institute, Great George Street, Westminster. The matter in dispute, it will be remembered, was the value of certain lands near Chapeltown, and adjoining Wayoh and Bradshaw Brooks, taken for the purposes of the Corporation Water-Works. Mr. John Cross, on behalf of P. R. Hoare, Esq., the owner, valued the land and the minerals at £26,200; but the Corporation disputed the existence of minerals under the land, alleging that there is a 'fault' which extends over the whole of it, and that therefore the land is not worth more than £500. The last sittings were held in February and April of 1873. The question happily is now in train for settlement without further expense."

St. Helen's Corporation Water Supply.—A special meeting of the St. Helen's Water Committee was held last Wednesday, to consider what should be the amount of the water-rate for this year. The Borough Treasurer (Mr. Johnson) submitted the statement of receipts and expenditure for the year ending March 25 last. The income from house supply was £5151; meter supply, £5831; meter-rents, £242; and a number of minor items made the total income £12,035. The arrears were £2404, while at March, 1879, they were £1692. The expenditure for the year was made up of the following items:—Working expenses, £10,933; sinking-fund, £2040; public works loan account, £617—total, £13,591, leaving a deficiency of £843. The working expenses were upwards of £830 less than in the previous year, and this although in the year just ended there was an extraordinary expenditure of £446. During a desultory conversation as to the financial position of the Committee it transpired that during the past year there has been a considerable diminution in the quantity of water consumed by the manufacturers; and had it not been for a remarkable reduction in the working expenses, the deficiency would necessarily have been much greater than it proves to be. It also transpired that the consumption of water by manufacturers is now on the increase, 87 million gallons having passed through the meters in March, 1880, as compared with 69 million gallons in March, 1879. The main point for the consideration of the Committee was the question whether the water-rate should be increased to cover the deficiency, or whether they should trust to an increased consumption of water taking place during the current year. It was ultimately resolved that there be no change upon the water-rates charged last year, which were 4½ per cent. on the gross rental of houses, and 5d. and 1-7th of a penny on water supplied by meter to works, &c.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

1509.—Kesseler, C., Berlin, "Improved arrangements of gas-flues for steam-boilers, evaporating pans, and the like." A communication. April 13, 1880.

1512.—Hills, W. A., Saltney, Flint, "The utilization of alkali waste, gas lime, or other forms of lime, for the production of tri-calcic and di-calcic phosphates." April 13, 1880.

1528.—Haddan, H. J., Westminster, "Improvements in apparatus for lighting and extinguishing gas-flames." A communication. April 14, 1880.

1537.—Morgan-Brown, W., Southampton Buildings, London, "Improvements in fluid-meters." A communication. April 15, 1880.

1539.—Liddle, E., Preston, Lancs, "Improvements in apparatus for lighting and heating by gas, applicable in part for igniting fuel to produce coal or other fires." April 15, 1880.

1545.—Sugg, W. T., Westminster, "Improvements in gas burners and lanterns." April 15, 1880.

1546.—Vale, J. H., Hamburg, Germany, "Improvements in apparatus for enriching gas by admixture of hydrocarbon vapour." April 15, 1880.

1567.—Engel, F. H. F., Hamburg, Germany, "Improvements in automatic apparatus for lighting, regulating, and extinguishing gas-burners." A communication. April 16, 1880.

1582.—Filer, A. E., Mildmay Park, London, "Improvements in gas-burners." April 17, 1880.

1594.—Quesnel, L., Paris, "Improvements in gas soldering irons." April 19, 1880.

1629.—Buckland, C., Swansea, South Wales, "Improvements in taps or cocks for water and other liquid." April 21, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

4222.—Joy, A. A., Chancery Lane, London, "Improvements in apparatus for regulating the flow of gas or other fluids." Oct. 18, 1879.

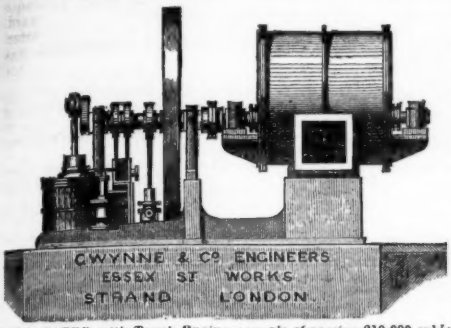
4337.—King, C. W., St. Swithin's Lane, and Cliff, A., Chancery Lane, London, "Improvements in and connected with engines actuated by the explosion or combustion of a mixture of combustible gas or vapour and air." Oct. 24, 1879.

4377.—Butcher, J. J., Gateshead, Durham, "Improvements in gas motor engines." Oct. 27, 1879.

4396.—Purssell, J. R., Blackfriars Road, London, "An improved arrangement of apparatus for moving tramcars and other like vehicles by gas-engine power." Oct. 29, 1879.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

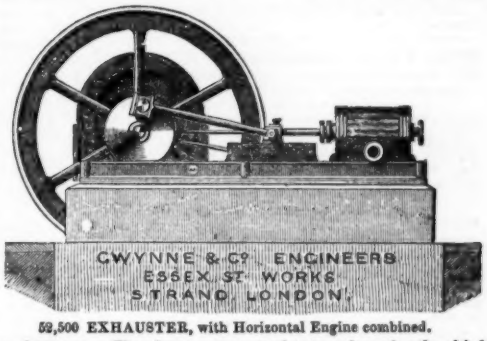
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

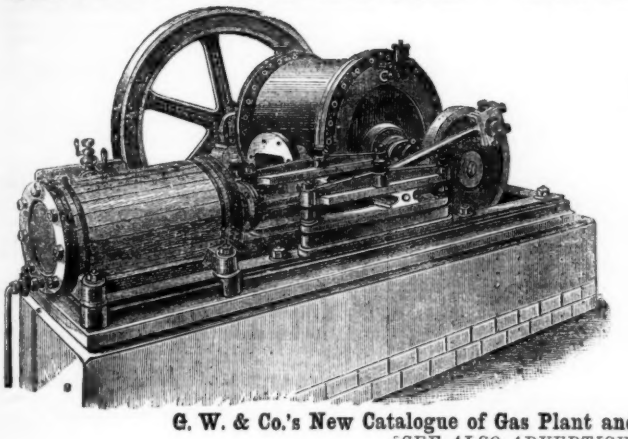
GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.**, Hydraulic and Gas Engineers,
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



WITH

Wrought-Iron Spindles and

ENGINES COMBINED.

SOLE MAKERS,

GEORGE WALLER & CO.

MAKERS OF ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[*SEE ALSO ADVERTISEMENT, PAGE* 654.]

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, by a Young Man (married), a Situation as MAIN and SERVICE LAYER. Is used to Gas-Works. Can Fix and Read Indexes of Meters. Is the son of a Manager, and has had some experience in an Engineer's shop, both at Lathe and Vice. Very steady.
Apply to the MANAGER, Gas-Works, Crayford, KENT.

WANTED, a steady Man as FOREMAN in a Provincial Gas-Works.
Apply by letter, stating age, family, and wages required, to No. 651, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS.

WANTED, a Working Gas Engineer or FOREMAN, to take charge of the Gas-Works at Mountain Ash, near Aberdare. One with some knowledge of Water-Works would be preferred.
Apply to Mr. W. BELL, Merthyr Vale, near Merthyr, SOUTH WALES.

WANTED, to proceed to Monte Video, a MECHANIC thoroughly conversant with the Working and Repairing of Water-Meters. One acquainted with Spanish preferred.
Apply, with copies of testimonials and references, to the Monte Video Water-Works Company, 5, Copthall Buildings, LONDON, E.C.

RETORT FOREMAN at Gas-Works Wanted, acquainted with Making Gas from Wood and Naphtha, &c.
Apply to WILLIAM BLEWS AND SONS, Gas Engineers, BIRMINGHAM.

THE West Bromwich Improvement Commissioners propose to appoint a Manager at their new Gas-Works. Make about 130 millions. Salary £250, with house, rates, firing, and gas.
Applications, stating age, qualifications, and enclosing two original testimonials, to be sent to me by the 1st of May next.
Applicant to enter on duties on the 25th of June next.
By order,
CHAS. H. BAYLEY,
Clerk to the said Commissioners.
Town Hall, West Bromwich, April 16, 1880.

MANCHESTER CORPORATION GAS-WORKS.

THE Gas Committee are prepared to receive APPLICATIONS for the Appointment of ENGINEER at the salary of £1000 per annum. Candidates must possess a thorough practical knowledge of Mechanics and Gas Engineering, the Preparation of Plans and Construction of Gas-Works and Apparatus, the Manufacture, Purification, and Distribution of Gas upon the most approved modern system, and the various chemical operations in connection therewith.
The Engineer will be required to devote the whole of his time to the service of the Committee, and will be wholly debarred from undertaking private practice.
Sealed applications, endorsed "Application for Appointment of Gas Engineer," stating the name, age, and experience of the candidate, and accompanied by testimonials, are to be addressed to the Chairman of the Gas Committee, and delivered at the Gas Offices, Town Hall, Manchester, before noon on Thursday, May 6, 1880.
The Committee wish it to be distinctly understood that any candidate canvassing will be disqualified.
By order,
JOSEPH HERON, Town Clerk.
Town Hall, Manchester, April 9, 1880.

WANTED, to Lease a small Gas-Works, by a Practical Gas Engineer.
Address No. 654, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BATH GASLIGHT AND COKE COMPANY.

TO GAS ENGINEERS.

THE appointment of Engineer to the above Company will be vacant on the 1st of July next.
The Directors are therefore open to receive applications for the same not later than May 4, to be addressed to the CHAIRMAN of the Company, stating qualifications, age, salary required, references, &c.
A residence is provided.
Offices, Upper Bristol Road, Bath, April 2, 1880.

WANTED, a small Portable Boiler, suitable for Steaming and Clearing Condensers, Mains, &c., of a small Gas-Works.
Address, with particulars, the Gas Company, Whetstone, near LEICESTER.

TO ENGINEERS AND MANAGERS OF GAS-WORKS.

WANTED, good Second-hand Gas Plant as under:—
Two 12 ft. by 4 ft. by 4 ft. Cast-Iron Tar Tanks, complete.
One 4-in. Tar Pump.
One 8-in. Annular or Square Condenser, with Upright Inlet and Outlet Pipes, Bye-pass Valves, &c., complete.
One 8-in. Governor (latest improved), Bye-pass Valves, &c., complete.
105 9-ft. Lengths 8-in. Socket and Spigot Pipes.
Six 5-ft. Lengths, Spigot ends only.
Six 8-in. Flange and Spigot T's.
One 12-in. Rack and Pinion Valve.
One Purifier, 14 ft. by 7 ft., Wood Sieves, &c., complete, with 8-in. Inlet and Outlet Well Pipes.
Retort Mouthpieces, D's, 18 in. by 13 in., Cross-bars and Lids, 6 in. by 4 in. Ascension-Pipes, 4-in. Saddle-Pipes, 4-in. Dip-Pipes.
State price per ton delivered into trucks at nearest Railway Station.
Apply to J. T. KENDLE, Metropolitan Hotel, Finsbury Circus, LONDON.
April 22, 1880.

AMMONIACAL LIQUOR at Foreign Gas-Works. Wanted best Apparatus for its Economical Reduction.

Particulars to WILLIAM BLEWS AND SONS, Gas Engineers, BIRMINGHAM.

A BARGAIN.

FOR SALE—Seven New Iron Retorts, 7 ft. 6 in., 13 by 12½.

Apply to J. LINFORD, Manager, Gas Company, St. Neots, HUNTS.

FOR SALE—Gas Governors of very substantial construction on unusually favourable terms.

Particulars on application to the

IMPERIAL METER COMPANY, LIMITED,
King's Road, ST. PANCRAS, N.W.

FOR SALE.—A Set of Four Purifiers, with Centre-Valve, in one frame, measuring over all 12 feet, with sieves complete. Covers to above nearly new. The whole having been replaced by larger.

Apply to R. J. SHARMAN, Manager, Gas-Works, WISBECH.

SLEAFORD GAS COMPANY, LIMITED.

FOR SALE—Single Gasholder, 32 ft. by 14 ft., Counter-balanced, Connections and all complete, in good condition. Reason for removal, ground wanted.

Particulars to be had of HARRY WIMHURST, Manager.

FOR SALE—A Set of Four Purifiers, 10 ft. square by 4 ft. 6 in. deep, with Hydraulic Centre-Valve and 10-in. Connections; One Scrubber; Condensers; a Beale's Exhauster; and Two Steam Boilers, Hydraulic Main, Ascension, and Bridge Pipes, all of which may be inspected on application to

Jos. TIMMINS, Engineer, &c.
Gas-Wo ks, Leigh, Lancs.

GAS PLANT FOR SALE.

THE Maidstone Gas Company having enlarged their Works, offer the following Apparatus for Sale in good condition:—

SCRUBBERS.—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livesey's boards.

CONDENSERS.—One Set of Annular Condensers, consisting of 9 Pipes 17 ft. high, outer diameter 2 ft. 6 in., fitted with 12-in. Valves complete.

ENGINES.—Two 12-Horse Power Horizontal Engines in very good condition.

STATION-METERS.—One Station-Meter, with Valves and Bye-pass for 20,000 per hour, in ornamental case (Milne); one Station-Meter, with Valves and Bye-pass for 6000 per hour, in cylindrical case.

HYDRAULIC MAIN.—Six 8 ft. by 18 in. Hydraulic Main D wrought iron; 24 8 ft. 9 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.

BRIDGE AND ASCENSION PIPES.—90 6 in. by 4 in. Bridge-Pipes, and a quantity of 6-in. Ascension-Pipes and Bends.

For further particulars and price apply to

JOHN WEST, Engineer and Manager.
Gas Works, Maidstone, April 21, 1880.

THE Sheffield United Gaslight Company OFFER for SALE the following lots of Retort-House FITTINGS, which they are now taking down at two of their Stations:—

54 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 18 in.
16 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 15 in.
4 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 16 in. by 15 in.
320 Cast-Iron Mouthpieces, D-shaped, 21 in. by 15 in.
160 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 7 ft. 6 in. long.
215 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 6 in. long.
50 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 5 ft. 6 in. long.
60 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 2 ft. 8 in.
37 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 10 ft. 2 in.
40 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 10 in.
17 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 5 in.
481 Lengths 4-in. Cast-Iron H-Pipes.
506 Lengths 4-in. Cast-Iron Dip-Pipes.

The above apparatus has been in use up to a recent date, and is adapted for re-erection.

The Company will be prepared to receive an offer for the whole or any portion of the above. Price £4 per ton, loaded into trucks at Sheffield.

Applications to be addressed to the undersigned.

THOS. ROBERTS, Manager.
Gas Office, Sheffield, March 25, 1880.

THE Leatherhead Gas Company invite TENDERS for the Supply of 1000 Tons of Best GAS COAL, to be delivered during the Twelve months commencing the 10th of May next, and ending May 10, 1881.

Tenders to be accompanied with analysis, and to be sent in by the 3rd of May next.

Price to include delivery at Leatherhead Railway Station.

The Directors do not bind themselves to accept the lowest or any tender.

Further particulars may be had on application to

A. J. GREEN, Secretary.

CITY AND GUILDS OF LONDON INSTITUTE FOR THE ADVANCEMENT OF TECHNICAL EDUCATION.

CHEMICAL TECHNOLOGY.

PROF. ARMSTRONG, Ph.D., F.R.S., will give a Course of Twelve Lectures, commencing May 10, 1880, on Fuel and Electro Deposition of Metals; and a Course of Tutorial and Laboratory Instruction in Photographic Chemistry, at the temporary Laboratories of the Institute, Cowper Street Schools, Finsbury.

Detailed Prospectus of Instruction to be had on application to

PHILIP MAGNUS, B.Sc., B.A.,
Director and Secretary.
Gresham College, Basinghall Street, E.C.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.

Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.

Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

GAS PLANT FOR SALE.

THE Coventry Gas Company have for SALE—

SCRUBBERS.—One 5 ft. 6 in. diameter, 20 ft. high. One 5 ft. 6 in. diameter, 15 ft. high. One 5 ft. diameter, 20 ft. high; with or without 8-in. Connections and Valves.

GASHOLDER.—One Telescopic, 40 ft. diameter and 34 ft. high, in two lifts; Cast-iron Tank for same, 41 ft. 6 in. diameter, 18 ft. high.

STEAM-JET VENTILATOR.—One No. 2 Körting's Patent Jet Ventilator, with Chest. One No. 3½ Körting's Patent Jet Blower.

VALVE.—One 12-in. Cathels's Four-way Valve.

The above are being replaced by larger apparatus, and can be removed at once. Also a 100-light Gas Apparatus (Porter's make); this includes a Gasholder, 14 ft. diameter and 10 ft. high, which could be sold separately.

For particulars and prices apply to

W. L. ROBINSON, Manager.
Gas-Works, Coventry, April 17, 1880.

TENDERS FOR COALS.
SPECIFICATION.

THE Derby Gaslight and Coke Company are prepared to receive TENDERS for the Supply of 30,000 Tons of SOFT COALS and SOFT COBBLES or NUTS, to be divided into Six Contracts of 5000 Tons each, and to be delivered in the following monthly quantities, viz.:—

	Tons.
1880—May	240
June	240
July	300
August	420
September	500
October	560
November	570
December	570
1881—January	500
February	400
March	400
April	300
Total of each Contract	5000

The Company will undertake to receive from the party or parties contracting the total quantity of 30,000 Tons, in one, two, three, four, five, or six contracts, as the Board may decide; but they do not bind themselves to accept the lowest or other tender or tenders, until after a satisfactory trial of the Coals and Cobbles or Nuts to which such tender or tenders may relate shall have been made. They are to be the best of their kind, and as free as possible from sulphur, bats, bind, refuse, and dirt, and shall be weighed upon a correctly-adjusted machine.

Payments will be made monthly, if, and so long as, the Contracts shall be duly fulfilled, to the extent of nine-tenths of the amount of the invoices, and the balance will be discharged on the satisfactory completion of the Contract.

Sealed tenders (to be made on forms obtainable at the Company's Office), specifying the description of Coals and the Pits at which they are to be raised, and stating the prices for delivery by canal at Derby, at the New Gas-Works adjoining the Midland Railway Company's premises, or at the Canal Wharf, and also the price delivered at either of the Midland Railway Stations, or at the Great Northern Station, Derby, and in manner and subject to the conditions aforesaid, must be delivered at the Offices of the Company, Friar Gate, on or before Saturday, the 1st day of May proximo.

The respective contracting parties will be required to execute an agreement to be prepared by, and to the satisfaction of the Secretary of the Company.

By order of the Directors,

ISAAC FISHER, Secretary.
Derby Gas Office, April 13, 1880.

TAR AND AMMONIACAL LIQUOR FOR SALE.

THE Directors of the Berwick and Tweedmouth Gaslight Company are prepared to receive TENDERS for Three years, commencing the 26th of May next, for the TAR and AMMONIACAL LIQUOR produced at their Works, Spittal. Quantity of Coals carbonized, about 1900 tons per annum.

Tenders are requested to be lodged with the undersigned on or before the 30th inst.

J. WIGHT, Secretary.
Berwick-upon-Tweed, April 19, 1880.

TO AUSTRALIAN COAL COMPANIES.

TENDERS FOR COAL.

THE Directors of the Bombay Gas Company, Limited, are prepared to receive TENDERS for 5000 Tons of Australian COAL, delivered f.o.b. to the order of the Gas Company, at such times as they may direct between Oct. 1, 1880, and Oct. 1, 1881.

The Colliery and port of shipment, and name of, and depth of water at the Coal Staith, to be specified in the tender, and a pit certificate given on shipment.

The Directors do not pledge themselves to accept the lowest or any tender.

Further particulars to be obtained from the Secretary of the Bombay Gas Company, Limited, 6, Drapers Gardens, Throgmorton Avenue, LONDON, E.C., to whom tenders are o be addressed by the 31st of August next.

OXIDE OF IRON.

Gas Companies can be supplied with any quantity of Natural Oxide suitable for Gas Purification purposes. Shipped direct from the extensive estates in Co. Donegal of the Earl of Leitrim and Wybrants Olphert, Esq., D.L.

By thus purchasing from the producer a constant supply of the purest material will be ensured to the Gas-Works, and intermediate profits will be saved to the Shareholders.

For terms, references, and particulars apply to

JOHN BEATTIE,
FALCARAGH, CO. DONEGAL, IRELAND.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

Price 28s. each, handsomely bound in Morocco, cloth sides, gilt edged and lettered.

THE FIRST AND SECOND VOLUMES OF

KING'S TREATISE

On the Science and Practice of the Manufacture and Distribution of

COAL GAS.

Edited by THOS. NEWBIGGING, C.E., M.Inst.C.E., and W. T. FEWTRELL, F.C.S.

Orders received by WALTER KING, 11, Bolt Court, Fleet Street, London, E.C.

Sulphate of Soda & Hydrochloric Acid.

This day is published in 8vo., 708 pp., with 267 Woodcut Illustrations, drawn to scale, Price 36s., Vol. 2 OF A

THEORETICAL AND PRACTICAL TREATISE ON THE

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WITH THE COLLATERAL BRANCHES,

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Professor of Technical Chemistry at the Federal Polytechnic School, Zurich; formerly Manager of the Tyne Alkali Works.

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JOHN VOORST, 1, PATERNOSTER ROW.

Now ready, Second Edition, price 7s., by post 7s. 3d., the

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, M.I.C.E.

Orders to be sent to

WALTER KING,
11, BOLT COURT, FLEET STREET, LONDON, E.C.

CITY OF HEREFORD.

CANNEL COAL.

THE Gas Management Committee of the Hereford Corporation hereby invite TENDERS for the Supply of 150 to 200 Tons of CANNEL COAL, quality not less than 30-candle power, to be delivered at the Corporation sidings in such quantities as may be required during the year ending May 31, 1881.

Tenders, sealed and endorsed "Tender for Cannel," addressed to the Chairman, Gas Management Committee, are to be delivered by 11 a.m., on Tuesday, the 4th of May next.

The said Committee do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM DAVIS, Secretary and Manager.
Gas Office, Hereford, April 13, 1880.

TO MANUFACTURING CHEMISTS.

THE Gas Management Committee of the Hereford Corporation hereby invite TENDERS for the Purchase of the AMMONIACAL LIQUOR produced at their Works for One, Two, or Three years from the 1st day of June next.

The terms and conditions of the contract may be known on application to the undersigned.

Tenders sealed, and endorsed "Tenders for Ammoniacal Liquor," addressed to the Chairman, Gas Management Committee, are to be delivered by 11 a.m. on Tuesday, the 4th day of May next.

The said Committee do not bind themselves to accept the highest or any Tender.

By Order,
WILLIAM DAVIS, Secretary and Manager.
Gas Office, Hereford, April 13, 1880.

ULVERSTON LOCAL BOARD.

GAS AND WATER DEPARTMENT.

THE Gas and Water Committee invite TENDERS for the supply of 300 tons of CANNEL COAL for gas purposes, to be delivered in such quantities, and at such stated periods as may be required during the 12 months ending June 30, 1881.

The Cannel offered must be the best of its kind, and must be as free as possible from all bats and dirt.

Parties tendering must give full particulars of the Cannel offered and the colliery from which they propose to supply, and state the price per ton delivered, carriage paid, to Ulverston Station.

Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Cannel," will be received by me until the 29th inst.

JNO. SWAN, Engineer and Manager.
April 17, 1880.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Bristol United Gas-light Company are ready to receive TENDERS for the Purchase of TAR produced at each of their Stations, situated respectively at Avon Street, Canons Marsh, and Stapleton Road, from Jan. 1, 1881.

The approximate quantity of Tar made annually at each station will be—at Avon Street, 500,000 gallons; Canons Marsh, 350,000 gallons; Stapleton Road, 100,000 gallons.

Tenders to be for Three or Five years, but contracts will not be taken for a longer term than five years.

The terms and conditions of the contract may be known on application to the Secretary, at the Office of the Company, Canons Marsh, Bristol.

Tenders, sealed and marked "Tenders for Tar," must be delivered not later than Tuesday, May 4, 1880.

The Directors do not bind themselves to accept the highest or any tender.

By orders of the Directors,
HENRY H. TOWNSEND, Secretary.

SECOND-HAND ENGINES, EXHAUSTERS, BOILERS, &c.

THE Scarborough Gas Company invite OFFERS for the Purchase of their present Duplicate Exhausting Machinery, comprising Two 7-in. Cylinder by 14-in. Stroke Horizontal Steam-Engines; Two 20,000 cubic feet per hour Gwynne and Beale's Patent Exhausters; Two Hydraulic Governors in Connection with Throttle Valves of Engines; and Two Cornish Boilers, 11 ft. by 3 ft. 9 in.

The whole are of superior make and have been carefully used, and are well worth attention, being about to be removed for replacement by larger and more powerful apparatus.

The machinery may be seen in operation until the 30th of April, and further particulars may be obtained on application to the undersigned.

By order,
WILLIAM J. MOON, Manager.
Scarborough, March 5, 1880.

Imperial
METER COMPY.,
LIMITED,
Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.
KING'S ROAD, ST. PANCRAS.
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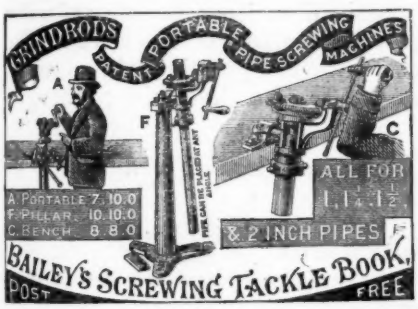

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Prices of Bailey's Double-Acting Steam-Pumps.

No.	Diameter of Steam Cylinder.	Diameter of Pump.	Length of Stroke.	Gallons pr. Hour. Approx.	Price.
	Inches.	Inches.	Inches.	At Slow Speed.	£
A 1	4	2	6	850	18
B 2	6	3	10	1,940	25
C 3	6	4	10	2,000	30
D 4	8	4	10	3,150	40
E 5	6	6	10	7,200	40
F 6	8	6	10	7,200	50
G 7	10	6	12	7,200	60
H 8	8	8	10	14,000	65
I 9	10	8	12	14,000	75
K 10	12	8	15	14,600	90
	10	10	15	21,000	110
	12	10	15	21,000	135

NOTE.—At quick speed these pumps will generally deliver double the quantity specified.

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From ½-horse to 4-horse Power. Particulars on application. We also make Hot-Air Pumping Engines, and every description of Hydraulic Work.
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SILVER MEDAL
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SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

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Undertake their ENTIRE ERECTION or EXTENSION in any part of the World, including Small Works for VILLAGES and MANSIONS, as well as of very LARGE EXTENT. Have recently constructed for the PHŒNIX GAS COMPANY the LARGEST GASHOLDER yet erected.

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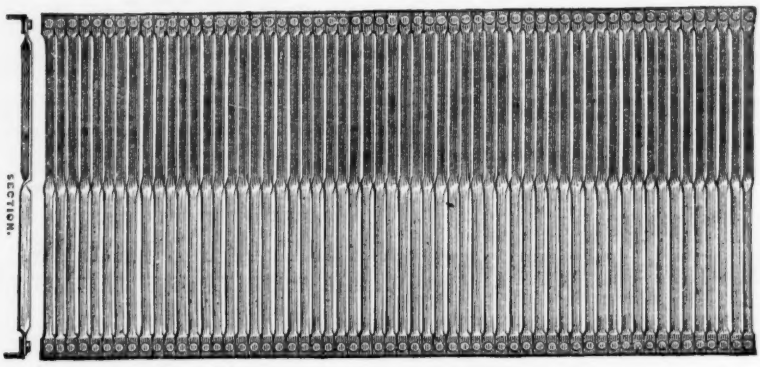

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Are the very best possible as PURIFIER VALVES; leakage impossible, most easy to work, never get out of order or the worse for wear, and can, if desired, be very simply arranged to work the whole or a part of a set of Purifiers in any conceivable order whatever. Have already been erected and approved at the London Gas-Works, Nine Elms; Phœnix Gas-Works, Greenwich; Maidstone, Ipswich, &c.

Full Particulars on Application.

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Are the most durable. The sieve bars presenting an inclined plane to the flow of the Gas, offer the least possible resistance, greatly reducing pressure, and permitting contact with every part of the purifying material. Have been supplied to many of the London and Provincial Gas-Works, and give great satisfaction.

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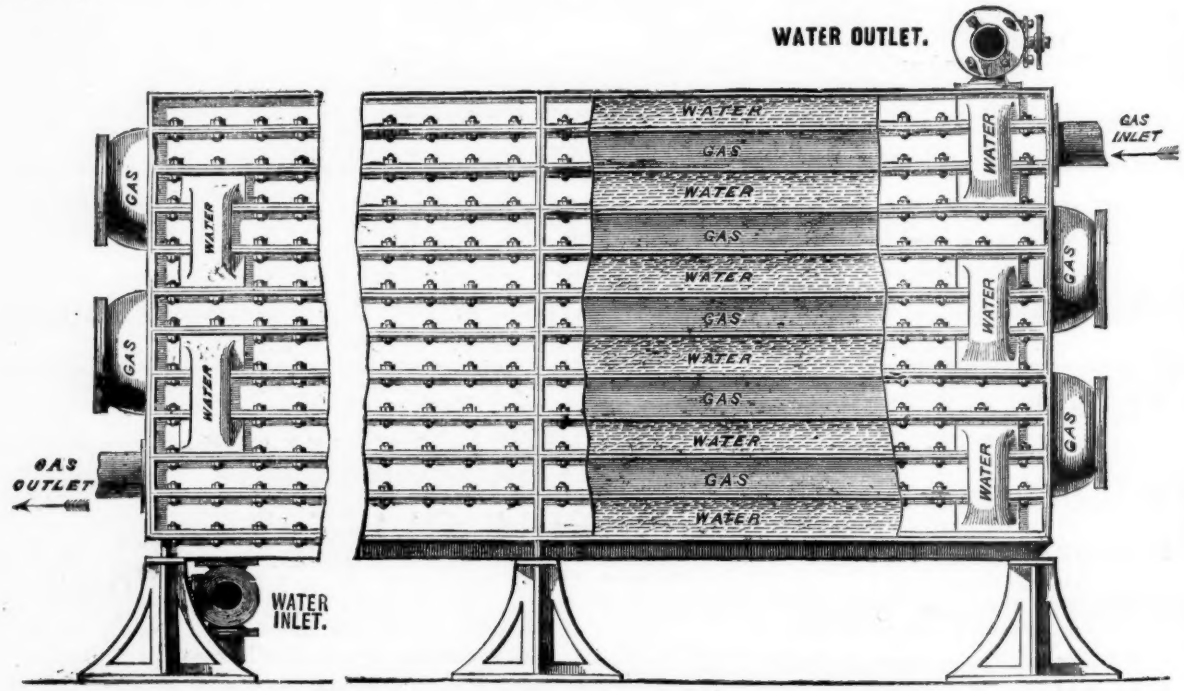
Adopt water as a cooling medium, the respective streams flowing in opposite directions; quantity of water required but small, and being only raised in temperature, is useful for any purpose of the works. The power of Condensers can be regulated at will by the amount of water permitted to pass through. Erected and giving great satisfaction at Brentford, Tunbridge Wells, Phœnix Gas-Works, Greenwich; where its advantages may be seen.

Mr. WATES, of Greenwich, has kindly offered to reply to any inquiries addressed to him as to its efficiency.



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[*See* JOURNAL for Nov. 25, 1879.]

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It has the following qualifications and properties:—

Effectually prevents and arrests corrosion.
Has a fine gloss, and is very durable.
Does not require driers like other paints.
Protects iron from action of water.

Is not affected by sulphuretted hydrogen.
Forms a very hard, tough (not brittle) surface.
Will not crack, blister, or scale.
Is not affected by extremes of temperature.

Covers nearly double the area of other paints. (7 gallons or 1 cwt. will cover 1211 square yards of ironwork.)
Is cheaper and more economical than any other.

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

ECONOMY IN THE PRODUCTION OF GAS.

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FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

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Are prepared to supply their celebrated **Real** Old Silkstone Gas Coal and Nuts. Prices quoted to any Railway Station, or f.o.b., Hull, Goole, Keadby, Grimsby, Liverpool, and Fleetwood. Every information given on application to above address, or to their Agent,

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BEST WIGAN ARLEY GAS COAL.

Yielding (as per analysis) 11,970 cubic feet of 16·39 candle gas per ton. Copies of analyses and testimonials from **Gas Companies** and **Managers**, who have used the Coal in large quantities for several years, will be forwarded on application.

Postal address, **CHORLEY**, Lancashire.

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GAS-WORKS FOR SALE ON THE CONTINENT.

The Comptoir Général of Gas and Water Works has been entrusted by several Proprietors with the Sale of their Gas-Works.

Value of Works.—The Prices vary from £4000 to £25,000.

Terms of Sale.—The Works are to be sold at the value of their present net Revenue, varying from 7 to 10 per cent.

Terms of Payment.—Either cash, or one-half cash and the other half to remain, at 5 per cent. interest, as a first mortgage charge on the works.

Duration of Concessions.—From 20 to 40 years. On their expiration, the Town Authorities either take over the works at a valuation, or renew the Concessions.

Applications will be received until the 20th of April, and any further information supplied by the

COMPTOIR GÉNÉRAL D'USINES À GAZ ET CONDUITES D'EAUX.

Le Directeur-Gérant,

B^N. L. MOSER DULFUS.

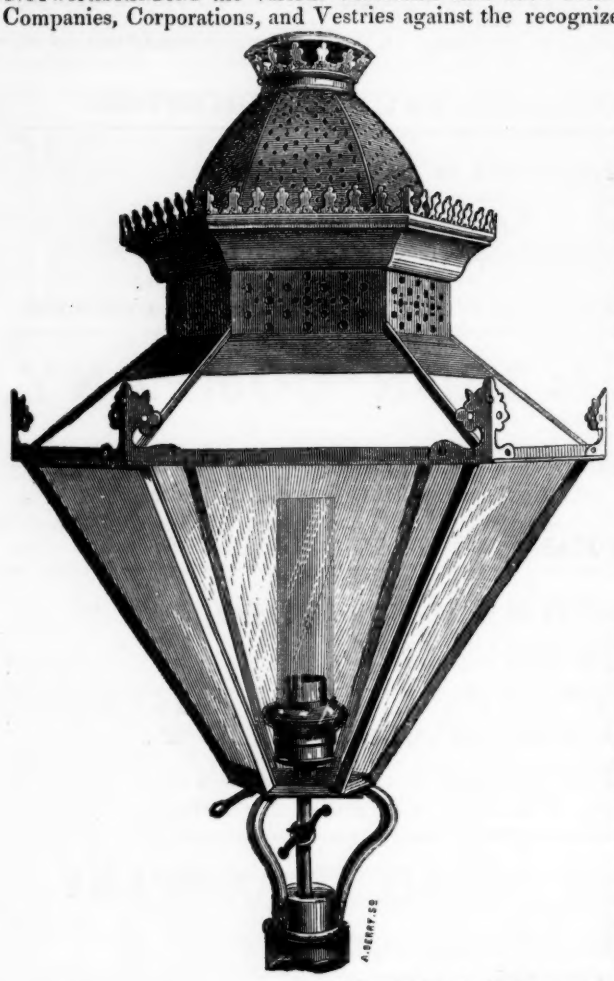
55, Rue Condorcet,
Paris March 8, 1880.

WILLIAM SUGG'S
IMPROVED SYSTEM OF STREET LIGHTING,

SUITABLE FOR CANNEL OR COMMON GAS.

NEW PATTERN LANTERN for "LONDON" ARGAND BURNERS of 50 to 400 Candle Illuminating Power, as supplied to the Metropolitan Railway Stations.

NOTWITHSTANDING the various statements that have been assiduously circulated of late, tending to prejudice Public Companies, Corporations, and Vestries against the recognized superiority of my large Argand Burners (established by tests made by eminent scientists, and confirmed by testimonials received from numerous Engineers of Gas-Works, which have appeared from time to time in the Advertisements of the JOURNAL), **the Highest Results** obtained at the recent trial of large Burners for Street Illumination held at Birmingham—where the most complete collection of large Burners and Lanterns extant had been assembled—were produced by the **200-candle and other large Argand Burners of my make**; clearly substantiating the statement I have repeatedly published, that the **Sugg Burners give over 30 per cent. Illuminating Power more than can be obtained from any other Burners with the like quantity and quality of Gas.**



It remains, moreover, to be mentioned that at the same trial my **Flat-Flame Burner,** with patent circular slit (patented 1875), produced the highest result in illuminating power of all the competitive Flat-Flame Burners present.

Amongst other places, the Burners and Lanterns have been adopted at—

PETERBOROUGH	DONCASTER	GREAT GRIMSBY
LEEDS	LONDONDERRY	SWANSEA
SCARBOROUGH	SHEFFIELD	CARDIFF
EASTBOURNE	BELFAST	W. HARTLEPOOL
DURHAM	OLDHAM	SOUTHAMPTON
CHESTERFIELD	GLASGOW	PORTSMOUTH
CORK	DUBLIN	LEITH
NOTTINGHAM	HASTINGS	PAISLEY
LEICESTER	SUNDERLAND	PERTH
STOKE-UPON-TRENT	ROCHDALE	WIGAN
RAMSGATE	SOUTH SHIELDS	READING
BLACKBURN	IPSWICH	SALFORD
GREENOCK	BRIGHTON	MANCHESTER
LIVERPOOL	COLCHESTER	BIRMINGHAM

Buenos Ayres, Monte Video, Hong Kong, Singapore, New York, Philadelphia, San Francisco, Milwaukee, Quebec, Ontario, Ottawa, Boston, Sydney, Melbourne, Port Adelaide, Berlin, Vienna, Cologne, The Hague, Amsterdam, Rotterdam, Brussels, &c., &c.

Extract from the JOURNAL OF GAS LIGHTING, *&c., March* 16, 1880.

EXPERIMENTS IN IMPROVED STREET-LIGHTING AT BIRMINGHAM.

PUBLIC TRIAL, WEDNESDAY, MARCH 10, 1880.

After a prolonged inspection of the various Lanterns and Burners, tests were made by a shadow meter between Sugg's 200-candle Argand (No. 9), Bray's 200-candle Quadruple Bat's-wing (No. 10), and the Burner and Lantern as used by the Paris Gas Company in the Rue du Quatre Septembre (No. 12), with the results as shown in diagram, fig. 2. These appear to agree pretty nearly with the photometrical results obtained from each Burner, as shown in the preceding table (Mr. Hunt's Experiments, see page 404 of JOURNAL, March, 1880.)

PHOTOMETRICAL TRIALS.

No. 9.
Sugg's 200-Candle Argand Opal Top, Consumption per hour 44 cub. ft.

No. 10.
Bray's 200-Candle Quadruple Bat's-wing, Consumption per hour 50 cub. ft.

No. 12.
Burner and Lantern used by the Paris Gas Company in the Rue du Quatre Septembre, Consumption per hour 32 cub. ft.

Light equal. 79·5 ft. >< 70·5 ft. 85 ft. >< 65 ft. *Light equal.*

150 ft. 150 ft.

FIG. 2.

NOTE.—The Lights were fixed on Posts in the manner they are used in the Public Streets.

THE RESULTS WORK OUT AS FOLLOWS:—

No. 9.
27 per cent. better than No. 10.
= 191·7 Candles.
Add 24·0 Candles for the extra 6 feet of gas required to equal the consumption of No. 10.

No. 10.
= 151 Candles, or 8 per cent. better than No. 12.

No. 12.
= 93·8 Candles.
If the consumption had been 50 ft., the Illuminating Power would have been at the same rate—138 Candles.

Total 215·7 Candles, or 42 per cent. better than No. 10 for the same quantity of gas.

The next best on the List is Sugg's 100-candle Argand Burner, as fixed on the Refuges in the districts of the Phœnix Gas Company, London Gas Company, Commercial Gas, and Gaslight and Coke Company. They have been, moreover, definitely adopted by the Vestries of Lambeth, St. George's, St. Mary's (Rotherhithe), Lewisham Board of Works, St. Giles's Board of Works, as well as the Great Eastern, Great Northern, London, Brighton, and South Coast, and Metropolitan Railways.

The fact that over 1200 of these large Burners and Lanterns have been supplied to almost every Gas Company or Municipal Authority in England alone, within a very short time, speaks significantly of the excellence of this system, and the real merits it has been proved to possess.

PRICES AND PARTICULARS ON APPLICATION TO

WILLIAM SUGG, GAS ENGINEER, VINCENT STREET, WESTMINSTER, S.W.

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45, OXFORD STREET, LONDON, W.

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BROAD STREET, BIRMINGHAM.

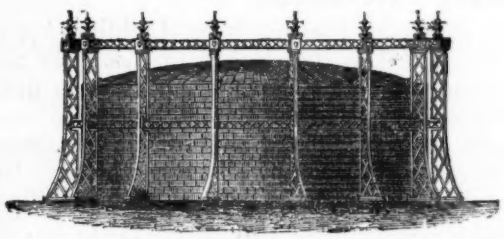
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

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GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

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Hydraulic Engineers,

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PUMPING MACHINERY of every Description.

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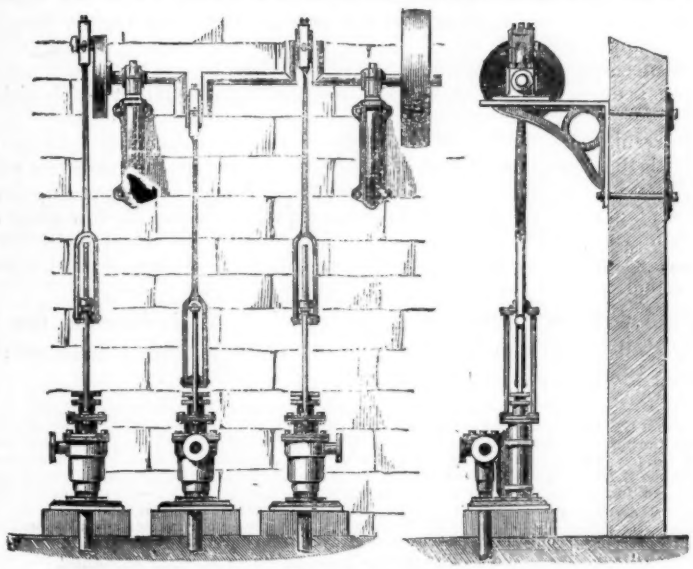
BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

SCOTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

MEMORANDUM FOR GAS COMPANIES.

TORBAY AND DART PAINT COMPANY, LIMITED,

SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S TORBAY PAINTS.

OFFICES:

23, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

WORKS:

DARTMOUTH AND BRIXHAM, DEVON.

TRADE MARK

These celebrated Paints are now very generally acknowledged to be the best and most economical in use. GAS COMPANIES especially have, by experience, proved that no others so fully meet their peculiar requirements, as they are not only UNAFFECTED BY GREAT HEAT and EFFECTUALLY RESIST SULPHURETTED HYDROGEN, AMMONIA, &c., &c., but they may be applied to GASHOLDERS that have hitherto been covered with the unsightly coal tar.

They are also cheaper than other paints and compositions; TWO COATS OF GENUINE WOLSTON'S TORBAY PAINT BEING EQUAL IN COVERING POWER TO THREE OF LEAD PAINT, or any of the numerous low-priced spurious oxides that are now in the market, whilst the durability of Wolston's is unrivalled.

The colours most approved for GASHOLDERS, PURIFIERS, SCRUBBERS, and all the plant and machinery used in and about Gas-Works, are—

FOR DARK TINTS.

No.	p. Cwt.	No.	p. Cwt.
13. Torbay Red	34s.	8. Bronze Green	36s.
6. Dart Brown	34s.	16. Torbay Chocolate	34s.
10. Carriage Red	34s.	4. Brixham Black	32s.
1. Torbay Brown	30s.		

FOR LIGHT TINTS.

No.	p. Cwt.	No.	p. Cwt.
7. Imperial Stone	34s.	19. Light Stone	36s.
29. Portland Stone	38s.	30. Bath Stone	38s.
31. Gray Stone	38s.	38. Buff	35s.

These Prices are for Paints in paste, carriage paid to any Gas-Works in Great Britain, in consignments of not less than 5 cwt.; but all the above colours may be had, READY MIXED FOR THE BRUSH, IN VARIOUS SIZED PAINT CANS WITH HANDLES, AT A UNIFORM PRICE OF 56s. PER CWT. (6d. PER LB.) carriage paid as above, in consignments of not less than 2 cwt., the sizes being 3 lb., 7 lb., 14 lb., and 28 lb. By taking the Paints in this convenient form, a considerable saving is effected in time, &c., as they can be immediately applied by any workman without the intervention of skilled painters to mix and prepare them; besides which all waste is avoided, and they may always be relied on as containing no adulterating or inferior material.

Where light colours are preferred, the work should be primed with two coats of No. 7, and finished with either of the other stone colours; and when the darker colours are selected, a priming coat of No. 13 is recommended.

Specimen Cards forwarded and Inquiries attended to on application to

23, GREAT GEORGE STREET, WESTMINSTER, LONDON.

BRAY'S
PATENT LANTERN AND FLAT-FLAME BURNERS.

THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING;

And, "in actual use," yields as much light with Common Gas, and more light with Cannel Gas, than any Argand System.

IMPORTANT NOTICE.

HAVING some time ago dealt with Mr. Sugg's statement that his Street-Lighting Apparatus yielded "over 30 per cent." more light "over all others" in the market, in a manner that caused its prompt withdrawal, we had hoped that the necessity would not have again risen to defend ourselves against statements calculated to mislead Lighting Authorities and the Public.

At the exhibition of gas-lamps, recently held at Birmingham, an error in Mr. Sugg's favour—admitted to be such by the Experimenters, and known to be such by all those who have had to do with making comparative tests with these Lanterns—having been made in the test with the 200-candle power Lantern, it has been extensively advertised without the correction accompanying it in Mr. Hunt's report.

A correct estimate of Mr. Sugg's fresh advertisement will be gathered from the following facts, which he has been careful NOT to publish:—

1. Mr. Sugg has NOT noticed Bray's 80-candle high lighting power Flat-flame, which Mr. Hunt tested along with the other burners we sent, and which Mr. Sugg knows to have yielded 3·51 candles per foot; and he has omitted to state that this is a higher result than that produced by either of his 80-candle Argands, which was 3·26 and 3·41 candles per foot respectively; and this without deducting the 40 per cent. that the Argand necessarily loses "in actual use" (*see paragraph* 5). A large proportion of the street-lighting apparatus sent out by Mr. Sugg are 80-candle power, and have been freely advertised as yielding "over 30 per cent. more light than all others," &c.
2. Mr. Sugg does NOT state that all Bray's burners, with which he compares his own in his advertisement, are of "**medium** lighting power," known to be such by the Birmingham authorities, and by Mr. Sugg, and distinctly stated to be such in all our lamp sheets. Therefore, in comparing his **high** lighting power with our **medium** lighting power burner, without stating the fact, he takes an unfair advantage of a competitor, and the public are deceived.
3. Mr. Sugg does NOT point out that there is but one (and that the least used) of the Argands which he names which shows a superiority of even 12 per cent. over Bray's above mentioned 80-candle power burner, and this should be corrected *as per paragraph* 5.
4. Mr. Sugg does NOT mention that the Flat-flame Burners he exhibited were beaten by Bray's 80-candle power Flat-flame to the extent of 8 per cent. in one test, and 12 per cent. in another, but he distinctly states that his Flat-flame Burners "produced the highest result in illuminating power of all Flat-flame Burners present."
5. Nor does Mr. Sugg draw attention to the fact that the Argand cannot be made to yield "in actual use" the light it shows when tested by the ordinary photometer, which is the same in principle as that adopted at Birmingham. We state—and our utmost effort has not availed us to get Mr. Sugg to contest the points with us—that the lack of top and bottom light (as compared with the Flat-flame) reduces the total all-round yield by about 20 per cent.; and that the Argand burner cannot be governed, "in actual use," to yield within 10 per cent. of its best, because of the liability of the flame to smoke with the slightest increase of pressure when working to its full capacity. And a further deduction of 10 per cent. must be made because of the chimney becoming rapidly dirty, and permanently opaque by use, if it does not happen to break.
6. Mr. Sugg also OMITS to mention that the Lantern in which his 200-candle power burner was tested was NOT the Sugg "Shadowless," of which there have been so many sold, but one designed by Mr. Hunt, which yields a much greater amount of light.
7. And while Mr. Sugg gives prominence to a result, admitted to be erroneous by the Experimenters (and has not accepted our offer to make another test with the same lamps), he entirely omits to mention the correction which accompanied the report from which he professes to quote. This correction showed that, when both apparatus were rated to consume exactly 46·75 feet of gas per hour, the lights were equal when the shadow meter was 73 feet 2 inches from Bray's Flat-flame Lantern, and 76 feet 10 inches from Hunt's Improvement on the Sugg Argand Lantern; this showing a difference of only 3 feet 8 inches; and from this result allowance must be made for the defects of the Argand when "in actual use," *as per paragraph* 5.

In view of the above, a proper estimate will be placed on Mr. Sugg's recent declaration that he "will have nothing to do with challenges," but "will continue to give, as he has always done, correct information of the results to be obtained from his burners and lanterns."

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[The above Lamps have Meters attached.]

Bray's Lanterns have been adopted by the Vestry of St. George's (which includes "WESTMINSTER"), Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting; and also by about 40 Towns and Vestries, after a similar competition in most cases.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.

SMEATON'S TRAPLESS CLOSETS.

MESSRS. W. SMEATON & SONS,
HOT WATER AND SANITARY ENGINEERS.

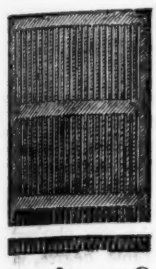
PATENTEES AND INVENTORS OF THE
TRAPLESS, THE D TRAP, AND EDDYSTONE CLOSETS.
Also the New
ECLIPSE COMBINATION CAST LEAD TRAP.

The Price will be half of the old-fashioned D Trap, it being cast all in lead, without a Joint. Send at once for an Illustrated Price List to their Wholesale and Retail Agent,

G. R. GLENIE,
WALBROOK HOUSE, 37, WALBROOK, LONDON, E.C.

A large Discount to the Trade and Shippers. Estimates Given and Contracts Taken.

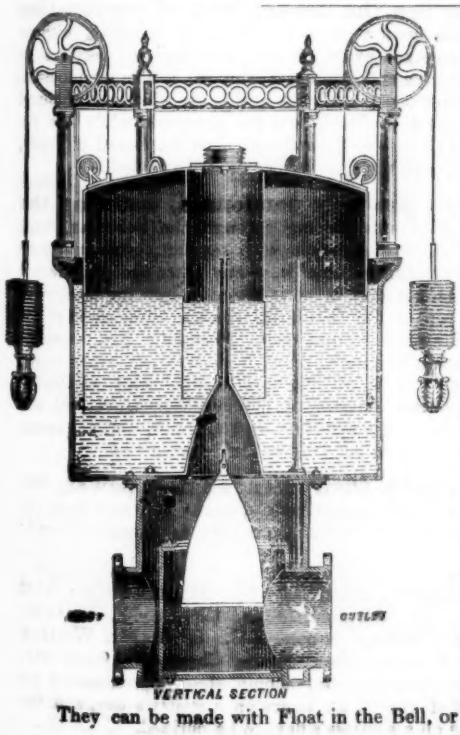
R. DEMPSTER AND SON'S



WOOD SIEVES FOR PURIFIERS,
WITH TAPER OR PARALLEL BARS,
MADE BY SPECIAL MACHINERY.
SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
Prices on application. References to First-Class Engineers.
ROSE MOUNT IRON-WORKS,
ELLAND, NEAR HALIFAX.
LONDON OFFICES: 2, SUFFOLK LANE, CANNON STREET, E.C.

J. & J. BRADDOCK,
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET AND DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
ROUND STATION-METERS,
ON CAST-IRON STANDS;
SQUARE STATION-METERS,
WITH PLANED JOINTS.

Messrs. BRADDOCK beg to submit to Gas Engineers their
PATENT COMPENSATING GAS GOVERNOR,
Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,
Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

MOBBERLEY & PERRY,
FIRE CLAY and BRICK WORKS,
STOURBRIDGE.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ESTABLISHED IN 1860.
BENJAMIN CARPENTER,
THE ORIGINAL MANUFACTURER OF THE IMPROVED
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.
PROVIDENCE WORKS,
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

The Dunston Engine Works Co.,
GATESHEAD-UPON-TYNE.
Are the Sole Manufacturers of
Archer's Patent Hoists,
ALSO OF
Archer's Patent Stone Breaker,
AND OF
Archer's Patent Ore Crusher & Pulveriser,
The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

GEORGE'S
Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
RECOMMENDED BY DR. RICHARDSON.
MANUFACTURERS:
J. F. FARWIG & CO.,
36, QUEEN STREET, CANNON ST., LONDON.

Gold Medal Awarded, Paris Exhibition, 1878.
THOMAS TURTON
AND SONS,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS,
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re-quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

LONDONDERRY GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

For Prices and Particulars, apply to

MR. S. J. DITCHFIELD,

LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.

J. & H. ROBUS,

BUILDERS AND CONTRACTORS

FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

ESTIMATES GIVEN FOR MAIN-LAYING.

N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

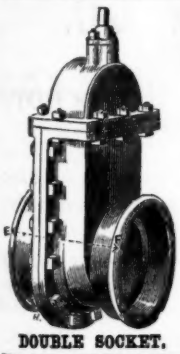
EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.



DOUBLE SOCKET.

IMPROVED SCREW-VALVES,

For Water, Tar, Ammoniacal Liquor, &c.

MADE EITHER WITH FLANGED OR SOCKET ENDS.

B. DONKIN & Co.

BERMONDSEY, LONDON, S.E.

W. PARKINSON & CO.,

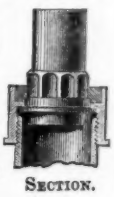
SOLE AGENTS FOR AND MANUFACTURERS OF

FOULGER'S PATENT SEAL UNIONS,

As Supplied to The Gaslight and Coke, Commercial, South Metropolitan, and other Companies.

These Unions practically place a Gas Company's property under lock and key, by rendering it impossible to disconnect at any joint at which gas can be obtained unregistered, without destroying the Company's Seal.

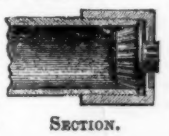
In fixing the Union (one being required on the main cock and another on the inlet only), some molten sealing-wax is poured into the recess on cap, and whilst hot impressed with Foulger's patent tong-shaped die, having the Gas Company's title engraved thereon; the wax being forced into the flutings on the lining, instant destruction of the Seal accompanies any attempt at disconnection.



SECTION.

FOULGER'S PATENT SEAL CUTTING-OFF CAPS

Cannot be taken off without destroying the Company's Seal. A tapered fluted plug (having been white-leaded or puttied) is inserted in the service-pipe. The cap (already filled with sealing-wax) is then screwed over, and tightens on a washer on the flange of plug. The wax is then warmed, and stamped with the engraved die. Absolute security against fraud and escape is thus obtained.



SECTION.

A great advantage will also be recognized in stopping the gas instantly with the plug, and consequent immunity from the present source of danger occasioned by escape during fitting the ordinary cap, frequently in a confined position, and often occupying a considerable time.

Small additional cost over existing connections.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67-*candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·35.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON. London Agent: Mr. F. J. LEE SMITH, 38 THROGMORTON ST.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

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DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY,

and every Article suitable for

GAS AND WATER WORKS.

THOMAS PROUD,

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103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

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ERECTION of CHEMICAL PLANT.

SPECIALITIES.

LIQUOR AMMONIA APPARATUS, GAS LIQUOR, URINE, &c.

GREAT IMPROVEMENT IN PLANT.

SULPHATE OF AMMONIA APPARATUS.

Continuous Method.

IMPROVED "COFFEY STILL" PROCESS, &c.

APPARATUS FOR MAKING AMMONIACAL LIQUOR FROM NITROGENOUS MATTERS.

Models of above plant, prices £2 10s., £3 10s., £7 10s.

Assistance given to parties erecting or about to erect Apparatus, either personally or by correspondence. Terms moderate.

JOHN G. HARVEY, MILNSBRIDGE, HUDDERSFIELD.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTER-MIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,800 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL.

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,280 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND CO., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete Analysis, on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

THE

SILICA FIRE-BRICK CO.,

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Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

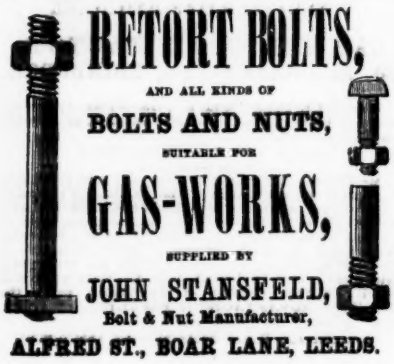
BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the AUTHOR; or at the Office of the "JOURNAL OF GAS LIGHTING."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

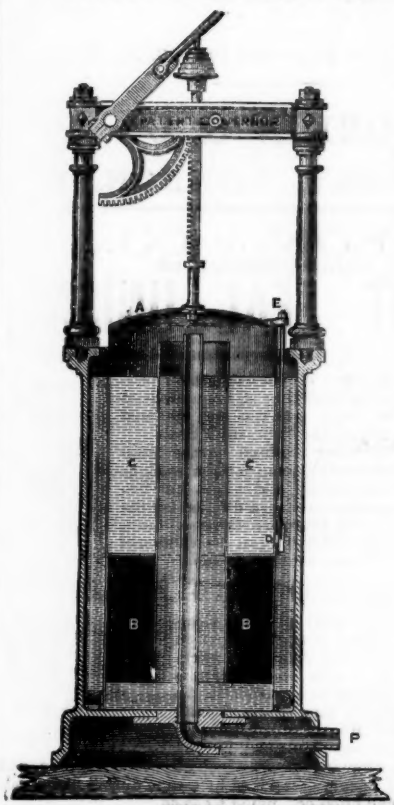
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

Patent Compensating Steam Governor,

WITH SELF-CONTAINED WATER-BALANCE.



This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

It is the only Governor that will effectually control Condensing and Compound Engines, especially when the Exhauster is on light work, and the Engine is large.

During the drawing and charging of Retorts, the Engine requires no attention—a matter of great importance in small works.

Descriptive Circular sent on application.

They are in use at

BECKTON,
HAMPTON WICK,
DUKINFIELD,
HARTLEPOOL,
NEWCASTLE-ON-TYNE,
RAMSGATE,
SUTTON,

and about 30 other works.

G. W. and Co. make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

See also advertisement, page 644.

PHŒNIX ENGINEERING WORKS,

Holland Street and Bear Gardens, Southwark, S.E.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

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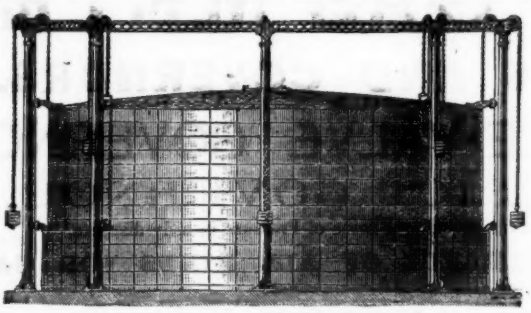

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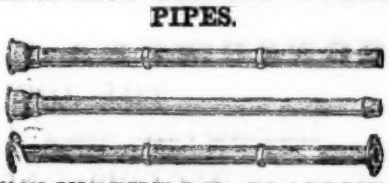

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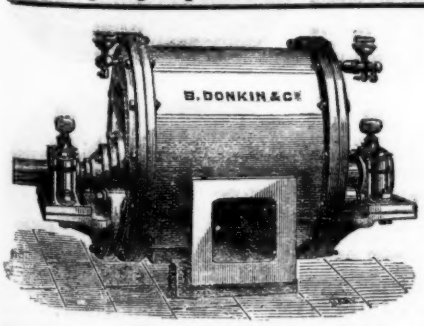

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